Southwest Highlands Watershed Assessment Report

Dillon Field Office

January 24, 2014

The Interdisciplinary Team evaluating a site along Camp Creek, June 18, 2013.

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Introduction

This document is a land health assessment of the public lands administered by the Bureau of Land Management (BLM) within the Southwest Highlands Watershed (SWHW).

This is the first in a series of documents: the Watershed Assessment Report, the Authorized Officer's Determination of Standards, and the appropriate National Environmental Policy Act (NEPA) documentation and subsequent Decision(s) changing management where needed.

The Assessment reports the condition and/or function of public land resources within the SWHW to the authorized officer. The authorized officer reviews the findings in this report to determine if the five standards of rangeland health are currently being met. The authorized officer then signs a Determination of Standards documenting where Land Health Standards are met and where they are not.

In addition to the condition/function assessment, the report also contains initial recommendations developed by the interdisciplinary team (IDT) during field assessments. The recommendations in the report focus primarily on livestock grazing, but also include other programs, land uses, and activities. These may include: noxious weed control, conifer expansion treatments, wildlife and fisheries habitat improvements, abandoned mine lands reclamation, forest and woodland management, and travel management. Impacts from all uses and programs were assessed and documented as part of this process.

The assessed condition, function and recommendations in the Assessment Report and Determination of Standards will be used in the NEPA process. An environmental assessment (EA) will be completed to address identified resource concerns in the watershed. The EA will include all BLM-administered public lands covered in the assessment.

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 other documented resource concerns or opportunities for improvement/restoration

Also, if existing grazing management practices or levels of grazing use on public 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 adjustments.

Implementation of new plans will begin in 2014, but full implementation of revised grazing plans, range improvement projects, and/or vegetation projects associated with these plans may take several years.

The new plans will be developed in consultation and coordination with the affected lessees, agencies having lands or managing resources within the area, and other interested parties.

The Dillon Field Office (DFO) completed a Resource Management Plan (RMP) in February of 2006. This document provides program guidance in the Dillon Field Office for the next 20 years. The RMP replaces The Dillon Resource Area Management Framework Plan (1979) and the Mountain Foothills Environmental Impact Statement (EIS) - Rangeland Management Program Summary (1981).

By working on a watershed basis, a broader landscape is considered and more consistent management can be applied. It is the BLM's intent to implement watershed management cooperatively. Any changes in livestock management will be implemented through grazing decisions that address allotments or groups of allotments with a common permittee. Any other management projects or changes will be implemented through decisions appropriate for the respective programs.

As with all similar BLM decisions, affected parties will have an opportunity to protest and/or appeal these decisions.

Background

The SWHW is located within Madison and Silver Bow Counties, Montana and drains portions of the Highland Mountains. The watershed lies within Townships 1-4 South and Ranges 7-9 West, Montana Principal Meridian (MPM). Those lands administered by the BLM within Silver Bow county are managed by the Butte Field Office.

The approximate boundary of the assessment area includes public lands administered by the BLM from the Big Hole River in the south and west, to Rochester Basin in the east, and to the southern U.S. Forest Service (USFS) boundary of the Highland Mountains in the north. The assessment area boundary, shown on the Southwest Highlands Allotments and Pastures map (Map 1), follows grazing allotment boundaries and includes some allotments that are only partially within the watershed. Technically, the assessed area is not a distinct watershed. Watersheds are defined, and designated on maps, by natural topographical boundaries (i.e., ridgelines, drainages). Grazing allotment boundaries have been determined by previous BLM decisions based primarily on land ownership and these artificial boundaries may not follow topographical features. Therefore, some of the grazing allotments in the assessment area may fall within one or more watersheds or hydrologic units. Grazing allotments within the SWHW may have been completed in other assessments (e.g., Beaverhead West, East Pioneers, and Rochester Basin/North Tobacco Roots).

Within the SWHW assessment area there are approximately 120,000 total acres of land, of which about 72,000 are public lands administered by the BLM and are allotted for livestock grazing. About 240 acres are currently unleased and lie outside existing allotment boundaries. No acres are categorized as unallotted (unavailable for livestock grazing). This report addresses only land health conditions on public lands administered by the BLM.

Vegetation

In this report, sagebrush and grassland areas are discussed under Standard #1 Uplands, while forest and woodland habitats are discussed under Standard #5 Biodiversity.

The variety and distribution of plant communities and seral stages in the watershed area is a function of climate, geology, and soil combined with:

- historic uses (e.g., grazing, mining, etc.)
- short term weather patterns
- disturbance regimes (e.g., drought, fire, floods, and herbivory)

Current vegetative cover was calculated using satellite imagery (LANDFIRE 2011b). Table 1 summarizes the estimated cover types on all land ownerships within the SWHW.

Table 1. Summary of acres by general cover type within the Southwest Highlands Watershed.

Cover Type	BLM Acreage	% of BLM Acreage	Total Watershed Acreage	% of Total Acreage
Forests	8,175	11.3	11,744	9.8
Grasslands	1,272	1.8	2,171	1.8
Sagebrush / Mountain Shrubs	61,114	84.8	93,581	77.9
Riparian / Mesic Shrubs	740	1.0	2,295	1.9
Mountain Mahogany [1]	0	0.0	165	0.1
Aspen	120	0.2	208	0.2
Other (Rock /Water/Ag)	659	0.9	9,932	8.3
Totals [2]	**72,080**	**100.0**	**120,096**	**100.0**

[1] Based on IDT field observations, LANDFIRE may not accurately detect curl-leaf mountain mahogany. According to SILC3 data (WSAL 2002), about 6,800 acres of curl-leaf mountain mahogany occur within the SWHW. These acres occur predominantly within the Sagebrush / Mountain Shrubs cover type.

[2] The slight difference between the acreages presented in Table 1, and the acreages previously presented, result from small variations between the two data sets.

Fire History

The presence or absence of fire plays an integral role in the composition and structure of the vegetation that occurs in the SWHW. Fire has shaped western landscapes for the past 10,000 years, but more than a century of settlement activities have seriously disrupted that crucial role. Since the mid-1800s, the frequency of wildland fires occurring in southwestern Montana and the west in general have been reduced by domestic livestock grazing, land use practices, and aggressive fire suppression. However, fire scarred trees and charred wood from past fires are found on timbered slopes throughout the Highland Mountains and on McCartney Mountain. The sagebrush/grassland communities that dominate the lower elevation BLM-administered land typically retain evidence of past wildfires for a relatively short amount of time.

Wilderness

There are no lands designated as Wilderness or Wilderness Study Areas within the planning area; however, in 2012, an inventory of lands within the SWHW was conducted to assess the presence of Lands with Wilderness Characteristics (LWC) as part of the Mountain States Transmission

Intertie (MSTI) project that was ongoing at that time. One area, known as Block Mountain (Inventory # MT- 050-059) was identified as containing the minimum wilderness characteristics of size, naturalness, opportunities for solitude and primitive and unconfined recreation. This area totals approximately 6,895 acres (Map 2). This unit was originally inventoried for wilderness values in 1979 as part of the FLPMA Section 603 inventory that was required at that time. Although it was found to contain the minimum characteristics identified above, it was not recommended to be carried forward as a wilderness study area due to the irregular configuration of the unit, and opportunities for solitude and primitive and unconfined recreation being determined to be less than "outstanding."

BLM policy released in 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. When those lands are not identified in the land use planning process (as the Dillon Field Office did not in the 2006 RMP), BLM is required to consider the effects of alternatives in project-specific NEPA analyses. These areas are not managed for non-impairment, as is required for WSAs, but any proposal that would affect the wilderness characteristics presently there, would have to be identified and disclosed through this NEPA process.

Prehistory and History of Southwest Highlands Watershed

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 SWHW 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). Historically, portions of the SWHW were originally explored by Lewis and Clark in the summer of 1805 eventually leading to further explorations during the fur trade in the 1830s. Due to the areas abundant precious metals, mining was the primary reason for settlement and occupation from the late 19th century through the early 20th century.

General Geology, Mining History, and Abandoned Mine Lands

The SWHW is part of a regionally mineralized belt with numerous mining districts crossing southwest Montana. It contains three mining districts which have produced a variety of metals since the late 1800's; the: Rabbit (Rochester), Melrose and McCartney Mountain mining districts.

The SWHW saw the discovery of the Watseca lode in 1866 bringing prospectors from all over the region in search of gold, eventually establishing the *Rabbit Mining District, (AKA the Rochester District).* Due to the large influx of people to the area, the mining camp of Rochester was eventually established nearby. Small-scale operations kept the district alive from the mid-1870s through the 1880s. In addition to gold mines, properties such as the Emma Mine (BLM) carried good values in silver and lead. In the mid to late 1890s, the Thistle Mine (BLM) dominated the Rabbit District, constructing a concentrator just below the mine along Rochester Creek. From early 1898 to 1905, the Watseca (private) proved to be the Rabbit Mining District's most productive claim, producing slightly less than $1.1 million and accounting for a little more

than half of the district's total production since its founding. A mill constructed at the Emma mine ran until 1932. During the heyday at the Watseca, the town of Rochester's population swelled to as many as 5,000 people, holding the distinction as the largest community in Madison County during that time. The mining district experienced other smaller gold booms between 1920 and 1940, however nothing compared to its earlier heyday. Total production for the district is estimated to be $2,500,000 (Sahinen 1935).

The Rabbit (Rochester) District lies on the south side of the Highland Mountains and is underlain by Archean gneisses and schists as discussed in the Geology section, which are intruded by granite dikes and sills. Ore deposits occur in north to northeast striking veins and dip steeply west (Montana DEQ 2013). In the late 1980s and early 1990s a cyanide vat leach operation was initiated at the Watseca. At this point there is an active claimant who holds the property, but no work is being conducted. Recent work in the district has focused on the removal of waste material for processing at the Golden Sunlight Mine in Whitehall.

The *Melrose District* is located on the southwest slopes of the Highland Mountains and includes Soap Gulch, Camp Creek, and Wickiup Creek. The upper end of Camp Creek is within the SWH watershed. Placer claims in this district have been worked intermittently since 1866. Silver mines, located primarily in Soap Gulch, operated until 1900 when Hecla's Glendale Smelter closed. Production from this district is reported to be 504,194 tons of ore (Montana DEQ 2013).

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.

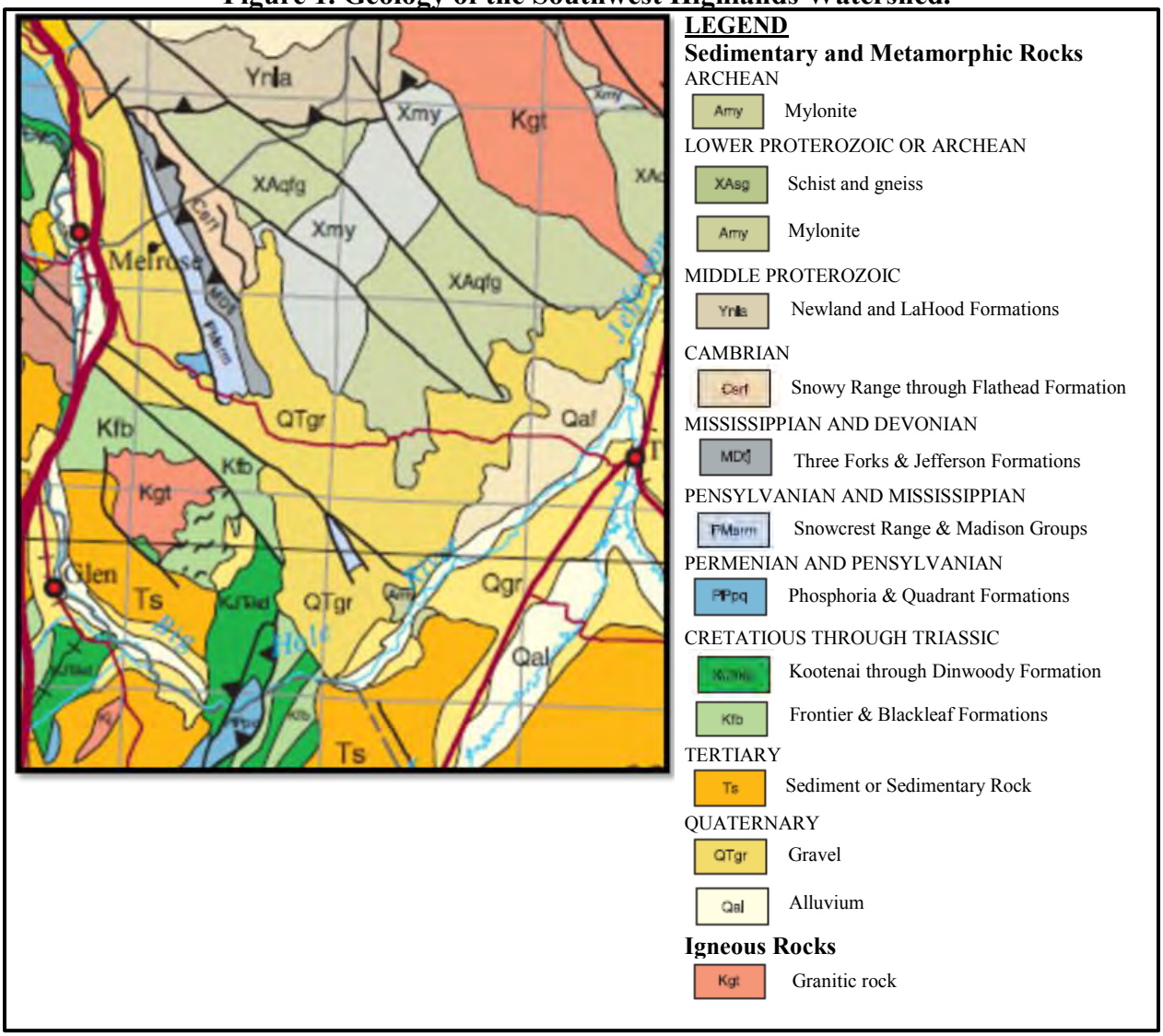
The *McCartney Mining District* surrounds the isolated Cretaceous granitic intrusion at McCartney Mountain. There is no evidence of production from the district though there has been exploration activity in the 1980s.

The geology of the SWHW is quite complex and includes igneous, metamorphic, and sedimentary rocks that cover virtually the entire Montana geologic section ranging from nearly three billion-year-old metamorphic rocks in the Rochester area to recent sediments along the Big Hole River valley (Figure 1).

The oldest rocks in the area, and some of the oldest rocks in Montana, are the Achean schists and gneisses in the Rochester area. These rocks date to over 2 billion years ago and have had younger Proterozoic rocks overthrust from the north in the northern portion of the planning area. To the west, the Archean rocks are unconformably overlain by Paleozoic sedimentary rocks including the Cambrian Flathead sandstone, the basal unit of the Paleozoic, and a sequence Devonian through Pennsylvanian carbonate units. Isolated outcrops of Permian rocks occur to the south and west in the area. Unconformably overlying the Paleozoic/Mesozoic rocks are Cretaceous sediments including the Frontier and Blackleaf formations. More recent Paleogene, Neogene and Quaternary sediments include extensive gravel deposits in the southern half of the SWHW and more recent alluvial deposits along major drainages.

Igneous rocks include Cretaceous granitic intrusions exposed in the northeast potion of the SWHW, east and north of Rochester and a contemporaneous intrusion at McCartney Mountain in the southwest corner of the SWHW.

Figure 1. Geology of the Southwest Highlands Watershed.



As discussed in the mining and permitted activities narrative, these units have been the host for extensive gold mineralization in the Rabbit Mining District or Rochester area and silver, lead and zinc in the Melrose Mining District or Soap Gulch area. This mineralization was the focus of extensive activity in the late 1800s and early 1900s. Recent activity in Soap Gulch has focused on small scale placer mining exploration. In the Rochester area recent work has focused on continued exploration and the removal and processing of waste dumps that remained from earlier mining operations.

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.

Visual Resource Management
Most of the lands within the watershed are identified as Class III, though lands surrounding the Rochester Mining District are identified to be managed as Class IV for Visual Resources. For VRM Class III, "The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention, but should not dominate the view of the casual observer. Changes caused by management activities may be evident but should not detract from the existing landscape." For VRM Class IV, the objective "is to provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements."

Authorized Uses

Forest Products
Forested resources in the watershed have been utilized since the beginning of European settlement during the 1860's. Evidence in the form of old stumps can be found throughout forested habitats in the assessment area. Extensive timber harvest occurred in association with the settlement of the area and mining activities. There have been no recent forest management activities (timber harvests) on BLM-administered lands in the SWHW.

Recreation
The SWHW is lightly used for dispersed recreation activities, with no developed recreation sites. There is one commercial outfitter permitted to use the area for mountain lion hunting under a Special Recreation Permit. The majority of the recreational use in this area is by motorized-vehicle users on the numerous roads that traverse the watershed. These roads provide opportunities for the public to enjoy challenging routes, outstanding scenery, historical mining

exploration, and, of course, big game hunting. There is, also, some limited dispersed vehicle-based camping, recreational rock-hounding, and geological study that occurs within the watershed.

Mineral Resources

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.

The Rochester (aka Rabbit) mining district lies partially in the SWHW and partially in the Rochester Basin/North Tobacco Roots Watersheds. Rochester has seen extensive mining activity for well over 140 years. As a result of this mining there were numerous waste piles generated. In recent years there has been significant interest in removing these waste piles that contain enough value to warrant shipping to an offsite facility for mineral extraction. There have been at least six removal projects take place or are taking place in this area in the past few years. Some are solely on patented land while some are on both patented and public land. In 2013, a Plan of Operation was submitted and approved to remove approximately 10,000 tons of waste material from various locations situated on both patented and public land. A part of this activity was in in the SWHW watershed and the other part was in the Rochester/North Tobacco Roots watershed. The project is currently in final stages and much of the reclamation has been completed.

There is currently one active 43 CFR 3809 Notice in this watershed which consists of a small placer exploration operation. The current disturbance is approximately one acre. There is also a mineral material site (decorative stone) located at T. 2 S., R. 8 W., Section 28. Stone is sold and essentially picked off the surface. This is a very low volume site and disturbance is very minimal.

Madison County has recently approached the BLM asking to establish two gravel sources within the SWHW. The first site, at T. 3 S., R. 9 W., Sec. 1, is located just north of the High road (Melrose to Twin Bridges road) and immediately east of I-15. It was previously established as a gravel source approximately 15 years ago to provide gravel to resurface the interstate highway. It has since been reclaimed. Some reclaimed areas would be disturbed along with some undisturbed area. This second site, located within T. 3 S., R. 8 W., Sec. 25, is a steep bluff along the north side of the High Road. If the site is developed the bluff would be mined from a small flat spot just off the main road. The county is in the process of testing the gravel to determine if it is suitable for use. These sites would greatly reduce shipping costs as they are located along roads the county is responsible for maintaining. They are intended as long term sources and would disturb up to 20 acres, however, disturbance at any one time would be kept to a minimum and reclamation would occur as soon as possible.

Livestock Grazing

There are 15 individual operators that have grazing permits/leases on 71,870 acres (12 allotments) of public land administered by the BLM in the watershed. The allotments are shown on the map of Southwest Highlands Allotments and Pastures (Map 1). Public lands, administered by BLM, provide a large proportion of the late spring, summer and fall forage base in the watershed. There are 6,554 animal-unit months (AUMs) of livestock forage allocated on public lands within the 12 allotments included in this assessment. The livestock grazing allocations and management for allotments within the SWHW are displayed in Table 2.

Table 2. Livestock grazing allocations and management within the Southwest Highlands Watershed.

Allotment Name, Number, and Category	Livestock Number & Kind[1]	Season of Use	Grazing System[2]	BLM Stocking Rate	BLM AUMs	BLM Acres	Acres in Other Ownership[3]	Total Acres
Buhrer, 30414, (I)	290 C	03/15-12/30	SL	8.4	84	707	PVT=38	745
Camp Creek, 30308, (I)	295 C	05/22-06/30	RR	14.7	345	29,279	FS=15; ST=1,766; PVT=4,615	35,675
	281 C	05/29-11/30	RR		271			
	147 C	05/22-06/30	RR		172			
	147 C	05/22-06/30	RR		172			
	86 C	05/22-06/30	RR		101			
	49 C	05/22-06/30	RR		57			
	206 C	06/02-07/02	RR		187			
	258 C	07/03-10/01	DU		687			
Dancehall Custodial, 30659, (C)	7 C	05/01-11/30	CU	12.8	49	629	PVT=681	1,310
Devil's Dancehall, 20327, (M)	250 C	05/01-05/30	RR	42.3	74	3,130	PVT=1,620	4,750
Garrison, 20314, (I)	290 C	03/15-12/30	SL	12.9	577	8,052	ST=640; PVT=454	9,146
	10 H	05/01-12/15			45			
Logan Smith, 20345, (I)	70 Y	10/16-12/15	DS	7.2	105	1,821	ST=652; PVT=15	2,488
	200 C	11/16-12/15	DS		148			
McCartney Mountain North, 20357, (M)	350 C	05/01-10/31	RR	8.3	805	7,913	ST=1,288; PVT=7,350	16,551
	74 C	11/01-04/10	DS		149			
McCartney Mountain South, 20366, (I)	290 C	03/15-12/30	RR	8.3	1890	16,225	ST=1,985; PVT=9,323	27,533
	14 H	05/01-12/01	RR		59			

Allotment Name, Number, and Category	Livestock Number & Kind[1]	Season of Use	Grazing System[2]	BLM Stocking Rate	BLM AUMs	BLM Acres	Acres in Other Ownership[3]	Total Acres
McCullough Individual, 20355, (C)	130 C	11/01-11/30	CU	3.4	128	436	PVT=141	577
Richards, 20315, (I)	22 C	07/01-09/30	RR	11.9	61	728	PVT=64	792
Seyler Pasture, 20354, (I)	70 C	10/01-04/15	DS	21.5	135	2,909	PVT=944	3,853
Triangle, 30359, (C)	1 C	05/01-11/30	CU	5.9	7	41	0	41
BLM Totals	**3,443C; 70 Y; 24 H**			**AVG = 13.1**	**6,554**	**71,870**	**FS=15; ST=6,331; PVT=26,068**	**104,284**

[1]*Livestock Kind: C=cattle, Y=yearling cattle, H=horses*
[2]*Grazing System: SL=season long, RR=rest rotation, DS=dormant-season use, DU=deferred use, CU=custodial use*
[3]*Other Ownerships: FS=US Forest Service, ST=Montana DNRC, PVT=Private*

All allotments in the Dillon Field Office have been categorized as *Improve* (I), *Maintain* (M), or *Custodial* (C), based on resource values and opportunities for improvement. Allotment category refers to BLM's level of management for a given grazing allotment and is used to establish priorities for distributing available funds and personnel during plan implementation to achieve cost-effective improvement of rangeland resources. Categorization is also used to organize allotments into similar groups for purposes of developing multiple use prescriptions, analyzing site-specific and cumulative impacts, and determining trade-offs. Allotments in the I-category are managed more intensively and are monitored more frequently. Allotments in the M-category are usually at a desired condition and are managed to maintain or improve that condition. Allotments in the C-category are usually isolated parcels with few resource concerns that are fenced in with larger parcels of deeded land, are managed in conjunction with the permittee/lessee's normal livestock operation, and are monitored less intensively.

The BLM has worked cooperatively with individual livestock permittees/lessees in the watershed for many years to develop Allotment Management Plans (AMPs) that prescribe grazing management to improve natural resource conditions. Of the BLM-administered lands in the watershed that are available for livestock grazing, about 98% (70,764 acres) are managed under formal AMPs, or have agreed upon grazing systems, that prescribe rest rotation, deferred rotation, a deferred season of use, or dormant season use (Table 2). About 2% (1,106 acres) of the BLM-administered acres that are available for livestock grazing are in custodial allotments, where BLM management inputs are minimal because of the small proportion of public land in the allotments (Map 1).

The stocking rate on BLM lands within the watershed averages 13.1 acres/AUM and varies from 3.4 to 42.3 acres/AUM. This wide variation is influenced by soils, vegetation, topography (aspect, elevation, and slope), distance from water, and local weather. Cattle (mature individuals or cow/calf pairs) are the primary type of livestock authorized on the allotments; however,

yearling cattle are authorized on one allotment and two allotments allow the flexibility to graze a few horses.

Process

This assessment was done in accordance with the following BLM regulations regarding Rangeland Health Standards (Standards) and other applicable guidance:

- BLM Manual H-4180-1, Rangeland Health Standards Handbook and Guidance for Conducting Watershed-Based Land Health Assessments.
- Code of Federal Regulation 43 CFR, Subpart 4180
- Record of Decision (ROD) - Standards for Rangeland Health and Guidelines for Livestock Grazing Management (S&Gs) for Montana, North Dakota and South Dakota.
- National Fire Plan

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

The preamble of the Western Montana Standards states: "The purpose of the S&Gs are to facilitate the achievement and maintenance of healthy, properly functioning ecosystems within the historic and natural range of variability for long-term sustainable use." Standards are statements of physical and biological condition or degree of function required for healthy sustainable lands. Achieving or making significant progress towards these functions and conditions is required of all uses of public lands as stated in 43 CFR 4180.1.
This assessment will report condition and/or function for the following five standards:

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

In addition, this assessment will report condition and/or function for forest and woodland habitats, and fire ecology. Forest and woodland habitats, and fire ecology can affect each of the five standards, but in this assessment will be reflected under Standard #5 Biodiversity, along with other factors that affect biodiversity (including Special Status Species and noxious and invasive species). These assessments are made on an allotment scale, with the exception of Air Quality, which is made at the watershed scale.

Condition/function statements regarding the Standards are made as:

- Proper Functioning Condition (PFC);
- Functioning At Risk (FAR), which is assigned a trend (up, down, static, or not apparent); or
- Nonfunctioning (NF)

Land Health Standards are met when conditions across an allotment are at PFC or FAR with an upward trend. This is dependent on scope and scale and determined by the Authorized Officer.

Trend monitoring data, existing inventories, historical photographs and standardized methodology are used by an IDT to assess condition and function. In addition, Ecological Reference Areas are identified by the IDT and used to compare health and productivity of similar sites and soils. Trend monitoring data, upland and riparian assessment forms, and photographic records used for this assessment are available at the Dillon Field Office. Technical references are also available at the Dillon Field office or online at http://www.blm.gov/nstc/library/techref.htm.

Format
The Upland, Riparian, Air Quality, and Water Quality Standards will follow the following format:

- **Affected Environment** - This section briefly describes the area and resources that were assessed.
- **Findings and Analysis** - This section describes the findings of the IDT during the field assessment.
- **Recommendations** - This section presents initial recommendations developed by the IDT during the field assessment.

Because of the complexities involved with addressing the Biodiversity Standard, the Affected Environment and Findings and Analysis are presented together and Recommendations are presented at the end of the section.

Uplands

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

Procedure to Determine Conformance with the Standard
The uplands were assessed on an allotment basis according to Interagency Technical Reference 1734-6, *Interpreting Indicators of Rangeland Health*, which is available at the Dillon Field Office or on online at http://www.blm.gov/nstc/library/techref.htm. This qualitative process evaluates 17 "indicators" (e.g., soil compaction, 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 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 to be present on the site. The IDT refers to these site descriptions while completing the upland evaluation matrix.

The IDT reviewed the long term trend study data including photographic records, conducted extensive field surveys, and used the Indicators of Upland Health assessment process to assess the functionality of the upland habitat in the SWHW.

The SWHW was also evaluated for weed infestations using treatment records and inventories from the Dillon Field Office, the Madison and Silver Bow County Weed Coordinators, and the IDT's collective observations during the field assessments.

Affected Environment

Soils

Soils in the SWHW 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 SWHW receive about 8 to 20 inches of average annual precipitation and fall into the Aridic and Ustic soil moisture regimes. On BLM-administered lands, within the watershed boundary, elevations range from about 4,800 feet, near the Big Hole River, to above 8,300 feet, on McCartney Mountain.

The soils within the watershed formed in alluvium, colluvium, and residuum mainly from quartzite, limestone, sandstone, andisite, rhyolite, and granitic rock sources. Major landforms include flood plains, stream terraces, alluvial fans, escarpments, hills, and mountain slopes. 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 textures are mainly sandy loams, loams, and clay loams; 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 50 percent. Salinity and sodicity (alkalinity) occur within the assessment area to a minor extent and 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 these soil's physical and chemical properties and variables. The main soil Orders encountered within the assessment area include: Alfisols, Entisols, Inceptisols, and Mollisols. Major Ecological Sites associated within the upland areas include: Saline Lowlands, Shallow, Limy, Limy Droughty, Droughty, Droughty Steep, and Loamy. Within the river and stream areas the major Ecological Sites include: Wet Meadow, Riparian Wet Meadow, Riparian Subirrigated, Subirrigated, and Overflow.

Vegetation

Most of the watershed's BLM administered uplands are dominated by sagebrush (85%), including mountain big sagebrush, Wyoming big sagebrush, basin big sagebrush, low sagebrush, and three-tip sagebrush. There are, also, sizeable areas that are dominated by curl-leaf mountain mahogany. Winterfat and Gardner's saltbush are found on many of the drier, limy sites in the watershed. Some of the prominent herbaceous species included in the grasslands are bluebunch wheatgrass, Idaho fescue, western wheatgrass, Sandberg bluegrass, needle and thread, prairie junegrass, and blue grama. These same species often comprise the understory vegetation in the sagebrush habitat types. Rubber rabbitbrush, green rabbitbrush, fringed sagewort, broom snakeweed, and pricklypear are common native shrubs found on numerous ecological sites

throughout the watershed. If any of these shrubs have greater than 5% canopy cover on a site, it usually indicates that site has been subject to some kind of past disturbance.

Special status plants, noxious weeds, and invasive species are discussed under Standard #5 Biodiversity.

Vegetative Treatments

Several vegetation treatments have been completed within the SWHW. Typically, the objective of the earlier treatments was to remove or reduce big sagebrush and/or seed crested wheatgrass to reduce erosion, increase water infiltration, and provide spring livestock grazing. More recent treatments have focused on reducing conifer expansion into sagebrush grassland. The specifics of each treatment are described in Table 3 and presented on Map 3.

Table 3: Vegetation treatments within the Southwest Highlands Watershed.

Project Name & Number	Allotment Name	Treatment	Acres	Date
Moose Camp Brush Control #470571	Camp Creek	Aerial application of 2, 4-D	9,925	7/21/1965
Seeding (Smith) #477384	McCartney Mountain North	Seeded crested wheatgrass	≈ 980	Unknown
Devil's Dancehall Experimental Fire	Devil's Dancehall	Prescribed Burn	3	4/24/1978
McCartney Rx Burn #476861	Garrison	Prescribed Burn	313	1986 & 1988
Soap Gulch Rx Burn	Camp Creek	Prescribed Burn	≈ 400	4/19/1990 & 10/30/1990
SW Highlands Rx Burns	Camp Creek, McCartney Mountain North, McCartney Mountain South, Garrison	Prescribed Burn	5,007	2006-2012

Findings and Analysis

Members of the IDT visited all the grazing allotments and the unleased public land in the SWHW during 2013 and completed 23 *Rangeland Health Indicator Evaluation Matrices* on various ecological sites and plant associations. In addition, 14 Daubenmire trend studies, 11 nested-frequency trend studies, and 25 permanent photo plots, many of which were established in the 1970s and early 1980s, were duplicated in 2012 to help determine vegetative trends. The data collected were summarized and compared with baseline and interim data providing supporting information, along with the photographic record, for interpreting the upland indicators (see Table 4, Upland Qualitative Assessment Summary). Descriptions of these upland monitoring methodologies are found in Interagency Technical Reference 1734-4, *Sampling Vegetation Attributes*, which is available at the Dillon Field Office or online at http://www.blm.gov/nstc/library/techref.htm.

Conifer expansion into sagebrush/grasslands is affecting Upland Health on a localized basis, and is discussed under the Standard #5 – Biodiversity. Table 4 outlines the findings at sites throughout the watershed where the IDT completed the Indicators of Rangeland Health evaluation matrix. A moderate departure from expected conditions is analogous to a FAR rating

(USDI 2005). Upland sites that were found to be in the none-to-slight or slight-to-moderate departure from expected conditions category are generally considered to be in PFC.

Table 4. Upland qualitative assessment summary of grazing allotments within the Southwest Highlands Watershed.

Allotment Name, Number, & Category	Pasture Name	Ecological Site	Dominant Plant Species	Degree Of Departure From Expected		
				SOIL SITE STABILITY	HYDROLOGIC FUNCTION	BIOTIC INTEGRITY
Buhrer, 30414, (I)	N/A	Limy-Droughty, 10-14" Precipitation Zone (PZ)	Blue grama/ needle-and-thread/ pricklypear	None-Slight	None-Slight	None-Slight
Camp Creek, 30308, (I)	Lower Soap	Sandy-Loam, 10-14" PZ	Bluebunch wheatgrass/ Wyoming big sagebrush	Slight-Moderate	Slight-Moderate	Slight-Moderate
	Upper Soap	Loamy, 15-19" PZ	Idaho fescue/ mountain big sagebrush	None-Slight	None-Slight	None-Slight
	Wickiup	Loamy, 15-19" PZ	Idaho fescue/ mountain big sagebrush	None-Slight	Slight-Moderate	Slight-Moderate
	Maloney	Droughty, 10-14" PZ	Bluebunch wheatgrass/ Wyoming big sagebrush	Slight-Moderate	Slight-Moderate	Slight-Moderate
	Klondike	Droughty, 15-19" PZ	Idaho fescue/ bluebunch wheatgrass/ mountain big sagebrush	None-Slight	None-Slight	None-Slight
	Bunyard	Loamy, 10-14" PZ	Blue grama/ needle-and-thread/ fringed sagewort	Slight-Moderate	Slight-Moderate	Slight-Moderate
	Desert	Limy-Droughty, 10-14" PZ	Needle-and-thread/ blue grama/ fringed sagewort	Slight-Moderate	Slight-Moderate	Slight-Moderate
	Mine	Droughty, 10-14" PZ	Bluebunch wheatgrass/ Sandberg bluegrass	Slight-Moderate	Slight-Moderate	Slight-Moderate
	Rochester	Droughty, 10-14" PZ	Needle-and-thread/ Sandberg bluegrass/ fringed sagewort	Slight-Moderate	Slight-Moderate	Slight-Moderate
	Jackrabbit	Limy, 10-14" PZ	Bluebunch wheatgrass / needle-and-thread	None-Slight	None-Slight	Slight-Moderate
Devil's Dancehall, 20327, (M)	South	Limy-Droughty, 10-14" PZ	Blue grama / needle-and-thread/ pricklypear	Slight-Moderate	Slight-Moderate	Slight-Moderate

Allotment Name, Number, & Category	Pasture Name	Ecological Site	Dominant Plant Species	Degree Of Departure From Expected		
				SOIL SITE STABILITY	HYDROLOGIC FUNCTION	BIOTIC INTEGRITY
Garrison, 20314, (I)	Bell Peak	Loamy, 15-19" PZ	Bluebunch wheatgrass/ Idaho fescue/ mountain big sagebrush	None-Slight	Slight-Moderate	Slight-Moderate
	Garrison	Limy, 10-14" PZ	Bluebunch wheatgrass / Sandberg bluegrass	Slight-Moderate	Slight-Moderate	Slight-Moderate
	Ziegler	Limy, 10-14" PZ	Blue grama/ needle-and-thread	Slight-Moderate	Slight-Modrate	Slight-Moderate
McCartney Mountain North, 20366, (M)	North	Loamy-Limy, 10-14" PZ	Needle-and-thread/ bluebunch wheatgrass	None-Slight	None-Slight	None-Slight
	West Lower	Droughty, 10-14" PZ	Bluebunch wheatgrass / needle-and-thread/ Sandberg bluegrass	None-Slight	None-Slight	None-Slight
McCartney Mountain South, 20366, (I)	Block Mountain	Limy, 10-14" PZ	Needle-and-thread/ blue grama/ pricklypear	Slight-Moderate	Slight-Moderate	Slight-Moderate
	Block Mountain	Droughty, 10-14" PZ	Bluebunch wheatgrass/ Sandberg bluegrass	None-Slight	None-Slight	Slight-Moderate
	Bronx	Limy-Droughty, 10-14" PZ	Blue grama/ needle-and-thread/ Sandberg blugrass	Slight-Moderate	Slight-Moderate	Slight-Moderate
	North Big Schultz	Droughty, 10-14" PZ	Bluebunch wheatgrass/ fringed sagewort	Slight-Moderate	Slight-Moderate	Slight-Moderate
Richards, 20315, (I)	N/A	Loamy, 10-14" PZ	Blue grama/ needle-and-thread	Slight-Moderate	Slight-Moderate	Slight-Moderate
Seyler Pasture, 20354, (I)	N/A	Limy, 10-14" PZ	Blue grama/ needle-and-thread	None-Slight	Slight-Moderate	Slight-Moderate

On the sites rated PFC or FAR with an upward trend, the quantitative monitoring data supports the findings of the IDT. The ecological condition at these upland sites is stable or improving. Evidence of erosion appears to be remnant of historical impacts, and generally matches what is expected for that ecological site. Tall cool-season bunchgrasses, specifically bluebunch wheatgrass, are slightly reduced in many sites throughout the watershed in comparison to the Ecological Site Guides. This is likely due to long-term spring and summer cattle grazing in these areas.

Across the SWHW, about 81% of the BLM-administered uplands are functioning properly or improving under existing management. This includes the uplands within all pastures of nine allotments. There are six pastures, within three allotments, that were identified as functioning-at-risk with a static or downward trend. These pastures comprise about 19% of the public uplands

in the SWHW. Generally, pastures that receive longer periods of spring grazing, or receive spring-grazing in successive years, showed a decline in canopy cover and species composition of cool-season bunchgrasses; whereas, pastures that receive dormant-season use, which promotes cool-season bunchgrasses, or receive complete rest from livestock grazing at regular intervals showed stable or increasing canopy cover and species composition of cool-season bunchgrasses. Additionally, in the more than 20 years since most of the vegetation treatments occurred, canopy cover of big sagebrush has returned to historic levels.

Buhrer – The Buhrer allotment is managed in conjunction with the Garrison and McCartney Mountain South allotments, on which grazing is authorized between March 15 and December 30. The ridges in this allotment are dominated by blue grama and needle-and-thread, while the sides of the draws are dominated by bluebunch wheatgrass, needle-and-thread, and Sandberg bluegrass. Indian ricegrass and bottlebrush squirreltail are also present on these sites. Trend monitoring data indicate that the frequency of needle-and-thread and fringed sagewort are increasing, while the frequency of other species is fairly static. The only source of livestock water is a ditch along the county road, which limits the length of time that livestock may use the allotment and the distance they travel to graze. The IDT observed rare active pedestalling, some soil loss, a slight shift in plant community composition and functional/structural groups toward blue grama and pricklypear, a slight reduction in annual production and litter. The remaining indicators matched what was expected for the ecological site. The IDT determined that this allotment is properly functioning, but could benefit from better defined grazing management.

Camp Creek – The Camp Creek allotment consists of 11 pastures. Of those, 9 pastures are managed under a rest-rotation system, in which the pastures are grazed during the spring (May 22 – June 30) for two consecutive years and rested during the third year. Grazing use in the remaining two pastures is deferred (July 1 – September 30). In 2012, the BLM cancelled the grazing preference for 240 (11%) of the 2232 AUMs authorized within the Camp Creek allotment, which provided greater flexibility to the existing grazing schedule.

The Bunyard pasture is a spring-use pasture. Vegetative canopy cover averaged 21% and was dominated by blue grama, needle-and-thread, Sandberg bluegrass, pricklypear, and fringed sagewort. The IDT observed short and stable water flow patterns, active pedestalling, slightly more bare ground than expected, a reduction in soil-stabilizing agents, and some soil loss in plant interspaces. Other observations included a moderate shift in community composition and functional/structural groups toward short grasses, moderate reductions in annual production and reproductive capability of perennial plants. The remaining indicators matched what was expected for the ecological site. Despite previous changes in grazing management, the upland resources in this pasture are functioning at risk and appear to be static.

The Desert pasture is a spring-use pasture. Vegetative canopy cover was 34% and was dominated by needle-and-thread, blue grama, Sandberg bluegrass, and fringed sagewort. The IDT noted short and stable water flow patterns, historic pedestalling, slightly more bare ground than expected, and movement of small size classes of litter. Additional observations included the absence of a soil organic layer, slight soil loss, a shift in plant community composition and functional/structural groups toward blue grama and fringed sagewort, and slight reduction in the

amount of litter, annual production, and reproductive capability of perennial plants. The remaining indicators matched what was expected for the ecological site.

In 2013, the Desert Pipeline was completed to bring water from an existing well, in the adjacent Mine pasture. This new livestock water development has improved distribution and reduced grazing use in over-utilized areas of the pasture. The upland resources in this pasture appear to be slowly responding to previous changes in grazing management. The IDT evaluated the upland resources in the Desert pasture as properly functioning with ample opportunity for improvement.

The Jackrabbit pasture is a spring-use pasture. Vegetation at lower elevations is dominated by blue grama and needle-and-thread, while vegetation at higher elevations is comprised of bluebunch wheatgrass, Sandberg bluegrass, needle-and-thread, and Wyoming big sagebrush. The IDT's observations included signs of past pedestalling and soil loss, abundant lichens, rocks, and litter, vegetated and stable gullies, very little litter movement, and some organic matter and biological crusts. The IDT, also, noted larger plant interspaces than expected, more short than mid-grasses, reduced annual production, litter amount, and reproductive capability of perennial plants, and some spotted knapweed in disturbed sites. The remaining indicators matched what was expected for the ecological site.

Since the 2004 assessment, the Gilfoy Well and Pipeline and the Jackrabbit Pipeline were constructed and have improved livestock distribution within the pasture. The IDT concluded that the rest and livestock water developments implemented after the last assessment are slowly improving the upland resources in the Jackrabbit pasture. It was rated as properly functioning with opportunity for improvement.

The Klondike pasture is a spring-use pasture, where the vegetative community was dominated by Idaho fescue, bluebunch wheatgrass, and mountain big sagebrush. The IDT noted evidence of past pedestalling, slightly reduced resistance to erosion, some soil loss, and a shift in functional/structural groups resulting in the dominance of mountain big sagebrush over cool-season bunchgrasses. The remaining indicators matched what was expected for the ecological site. One study site was adjacent to a 2006 burn unit, in which the mountain big sagebrush has achieved a height of 12-18" and the gray horsebrush has achieved a height of 8-12" in only seven years. Overall, the upland resources within this pasture are in functioning properly and healing from past management practices.

The Left Hand Fork pasture is a spring-use pasture that was cleaved from the Upper Soap pasture following the 2004 assessment. The uplands were dominated by Idaho fescue, bluebunch wheatgrass, and mountain big sagebrush. In 2009, a prescribed fire treatment was conducted to suppress conifer expansion into sagebrush grassland. This treatment was very successful and the bunchgrasses, forbs, and shrubs are responding well to the reduced competition for resources. The upland resources in this pasture are properly functioning under current management.

The Lower Soap pasture is a spring-use pasture. Total vegetative canopy cover was 52% and was dominated by Wyoming big sagebrush, bluebunch wheatgrass, and pussytoes. The IDT observed short and stable water flow patterns, some active pedestalling, more bare ground than

expected, reduced resistance to erosion and some soil degradation, smaller bunchgrasses and larger plant interspaces that reduce infiltration. The IDT, also, noted a shift in functional/structural groups in favor of shrubs, slightly reduced litter amounts, moderately reduced annual production, noxious weeds along roads, and a slight reduction in reproductive capability of perennial plants. The remaining indicators matched what was expected for the ecological site and photo monitoring indicates a long-term upward trend. The upland resources within the Lower Soap pasture are functioning at risk, but show improvement under current grazing management.

The Maloney pasture is a spring-use pasture, in which the vegetative community was dominated by Sandberg bluegrass, bluebunch wheatgrass, and mountain big sagebrush. Frequency data indicate that Idaho fescue, bluebunch wheatgrass, mountain big sagebrush and green rabbitbrush are increasing, while prairie junegrass, fringed sagewort, and pussytoes are decreasing. The frequency of Sandberg bluegrass and cushion phlox is fairly static. The IDT observed short and stable water flow patterns, some active pedestalling, slightly more bare ground than expected, movement of small size classes of litter, no soil organic layer present, signs of soil loss, larger plant interspaces than expected, a shift in functional/structural groups toward shrubs with few mid-sized bunchgrasses, slight decadence in the mountain big sagebrush, reduced litter amounts and annual production, and reduced reproductive capability of perennial plants. The remaining indicators matched what was expected for the ecological site. The upland resources within the Maloney pasture are functioning at risk, but are slowly improving under current grazing management.

The Mine pasture is a spring-use pasture, in which the dominant vegetation consists of bluebunch wheatgrass, Sandberg bluegrass, and needle-and-thread on hillsides and needle-and-thread and blue grama on the flats. The IDT observed deposition areas associated with water flow patterns, active pedestalling, connected bare areas, movement of small size classes of litter, no soil organic layer, signs of soil loss, a shift in plant community composition and functional/structural groups toward blue grama that is affecting infiltration, reduced annual production and litter amount and reproductive capability of perennial plants. The remaining indicators matched what was expected for the ecological site. The upland resources within the Mine pasture are functioning at risk with a static to downward trend.

The Rochester pasture is a spring-use pasture. The dominant vegetation was needle-and-thread, Sandberg bluegrass, blue grama, fringed sagewort, broom snakeweed, and cushion phlox. The IDT observed short and stable water flow patterns, active pedestalling with occasional terracettes, slightly more bare ground in plant interspaces, movement of small size classes of litter, signs of soil loss in plant interspaces and less organic matter than expected, and slightly less annual production and litter than expected. The study site exhibited good composition of bunchgrasses, but had more broom snakeweed and green rabbitbrush than expected. The IDT, also, noted higher mortality of mature Wyoming big sagebrush, but saw good recruitment of new seedlings. The remaining indicators matched what was expected for the ecological site. The upland resources within the Rochester pasture are functioning properly with opportunity for improvement.

The Upper Soap pasture is a deferred-use pasture, in which total vegetative canopy cover was 74% and was dominated by mountain big sagebrush, Kentucky bluegrass, and Idaho fescue. Trend monitoring data indicate that the vegetative community is fairly stable. The IDT noted signs of past pedestalling, little to no litter movement, a deep (8") soil organic layer, slight soil loss from a historic sagebrush treatment, slightly reduced annual production, an appropriate compliment of bunchgrasses, sagebrush, and forbs, and cheatgrass along the roadsides. The remaining indicators matched what was expected for the ecological site. There is, also, an active placer mining operation down slope from the study site. The upland resources in this pasture are properly functioning under current livestock management.

The Wickiup pasture is a deferred-use pasture. At one study site, vegetative canopy cover was 41% and was dominated by three-tip sagebrush, Kentucky bluegrass, and Idaho fescue. The IDT noted short and stable water flow patterns, slightly more bare ground than expected, little to no litter movement, a good root layer with lots of soil organic matter, slight soil loss, a shift in community composition resulting from the loss of basin wildrye, a shift in functional/structural groups with a greater presence of sagebrush than bunchgrasses, reduced annual production and litter amount resulting from the shift from basin wildrye toward big sagebrush, spotted knapweed along roads, and slightly reduced reproductive capability of perennial plants. The remaining indicators matched what was expected for the ecological site. Vegetative canopy cover at another study site was 81% and was dominated by mountain big sagebrush, Idaho fescue, and Kentucky bluegrass. The upland resources within the Wickiup pasture are properly functioning under existing grazing management.

Dancehall Custodial – The Dancehall Custodial allotment is managed in a custodial manner and grazed in conjunction with the adjacent private property. The uplands in this allotment were dominated by bluebunch wheatgrass, Sandberg bluegrass, and Wyoming big sagebrush, all of which exhibited good annual production and high vigor. Additionally, there were abundant rocks and the soil was coarsely textured, which minimized any opportunity for erosion. The IDT did not identify any concerns with the upland resources in this allotment.

Devil's Dancehall – Livestock grazing on the Devil's Dancehall allotment occurs during the active growing season (May 1 – May 30), but is mitigated by alternating rest between the two pastures. Vegetative canopy cover on the benches ranges from 22 to 27% and the dominant vegetation includes blue grama, needle-and-thread, and pricklypear. The benches were the site of a prescribed-fire treatment to impact blue grama, but the treatment appears to have negatively impacted the cool-season bunchgrasses, while having little effect on the target species. In Timber Canyon, there is better a composition of herbaceous species that includes bluebunch wheatgrass, basin wildrye, and Sandberg bluegrass. Wyoming and mountain big sagebrush are also present in Timber Canyon. The IDT's observations included short and stable water flow patterns, some active pedestalling, gullies that were stable and revegetating, and a few wind-scoured areas. The IDT, also, documented some reduction in the soil's resistance to erosion, some soil surface loss, a shift in dominance from needle-and-thread toward blue grama, a reduction in annual production and litter amount, slightly reduced reproductive capability of perennial plants, and the presence of spotted knapweed and black henbane. The remaining indicators matched what was expected for the ecological site. The upland resources within the Devil's Dancehall allotment are properly functioning.

Garrison – The Garrison allotment is used in conjunction with the Buhrer and McCartney Mountain South allotments, on which grazing is authorized between March 15 and December 30, and is comprised of three pastures, which rely, primarily, on natural barriers that are largely ineffective at managing livestock grazing. Dependable water sources have also been an obstacle for effective grazing management.

The Garrison pasture is a low- to mid-elevation pasture that contains three of the more dependable water sources and it is often used for extended periods during the grazing season. The IDT observed instability in water flow patterns, trailing impacts resulting in active pedestalling in plant interspaces, vegetation stabilizing existing gullies, movement of small size classes of litter, moderately reduced soil resistance to erosion throughout the site, and moderate soil loss. Bunchgrasses were small and widely spaced (i.e., increased runoff) and exhibited low vigor and productivity. The IDT, also, noted a shift in functional/structural groups in favor of shrubs over bunchgrasses, reduced annual production and litter amounts, black henbane and spotted knapweed along roads, and reduced reproductive capability of perennial plants. Bare ground, as determined by step-point transect was 36%. The remaining indicators matched what was expected for the ecological site. Trend monitoring data from a lower elevation site indicates that total vegetative canopy cover of 20%, which was almost exclusively blue grama. The upland resources in the Garrison pasture are functioning at risk with a static to downward trend under current grazing management.

The Ziegler Gulch is a lower-elevation pasture that is typically used early or late in the grazing season. Total vegetative canopy cover was 18% and was dominated by blue grama, needle-and-thread, and Sandberg bluegrass. The IDT observed water flow patterns with some connectivity and some instability, active pedestalling, bare areas of moderate size that were connected, a few blowout areas, movement of lichens, reduced soil resistance to erosion in plant interspaces, and soil degradation under plant canopies. Other observations included a shift in community composition and functional/structural groups toward blue grama, low vigor of bunchgrasses, and large plant interspaces, all of which increase runoff. Annual production, litter amounts, and reproductive capability of perennial plants were reduced and black henbane and halogeton were found along roads. The remaining indicators matched what was expected for the ecological site. The upland resources in the Ziegler Gulch pasture are functioning at risk with a static to downward trend under current grazing management.

The Bell Peak pasture is a mid- to high-elevation pasture that is usually grazed mid-to-late in the season, but has had less dependable water sources during the last ten years. Total vegetative canopy cover was 38% and was dominated by mountain big sagebrush, bluebunch wheatgrass, and Idaho fescue. The IDT observed short and stable water flow patterns, slightly more bare ground than expected, a slight reduction in soil resistance to erosion, the presence of a good A-horizon, some soil degradation, a slight shift in community composition and functional/structural groups favoring mountain big sagebrush over bunchgrasses, and slightly reduced annual production, litter amounts, and reproductive capability of perennial plants. The remaining indicators matched what was expected for the ecological site. Trend monitoring data indicate a relatively static trend and the IDT determined that upland resources in this pasture were properly functioning under current grazing management.

Logan Smith – The Logan Smith allotment is grazed during the dormant season (October 16 – December 15), annually. Total vegetative canopy cover was 29% and dominant vegetation included blue grama, needle-and-thread, and fringed sagewort, but Sandberg bluegrass and bluebunch wheatgrass are also present. Trend monitoring data indicate that the current vegetative community composition is in an extremely stable state. The Logan Smith allotment is properly functioning under current grazing management.

McCartney Mountain North – The McCartney Mountain North allotment consists of nine pastures and is managed under a rest-rotation grazing system.

Within the North pasture, in 2012, total vegetative canopy cover was 21% and was dominated by needle-and-thread and bluebunch wheatgrass, which comprised 51% and 24% of the community composition, respectively. Trend monitoring data indicate that bluebunch wheatgrass and prairie junegrass are increasing in frequency, and in proportion of canopy cover and community composition, while needle-and-thread and broom snakeweed are decreasing in proportion of canopy cover and community composition. The IDT observed short and stable water flow patterns, rare active pedestalling, slightly reduce soil resistance to erosion, and signs of historic soil loss. The remaining indicators matched what was expected for the ecological site.

In the West Lower pasture, the IDT noted signs of small historic pedestals, slightly higher than expected bare ground, and very little movement of liter. The soil surface was very resistant to erosion with excellent cover and good root structure. The IDT, also, noticed cheatgrass, houndstongue, and black henbane along roads and next to water troughs and that the clubmoss appeared to be dying. The remaining indicators matched what was expected for the ecological site. The IDT observed each of the seven pastures and these two pastures were chosen as representative of those within the allotment. The IDT concluded that the upland resources within the allotment were properly functioning.

McCartney Mountain South – The McCartney Mountain South allotment is managed in conjunction with the Garrison and Buhrer allotments, on which grazing is authorized between March 15 and December 30, and consists of seven pastures.

Within the Block Mountain pasture, trend monitoring data from one site indicate that vegetative canopy cover was 25%, was dominated by needle-and-thread, blue grama, and pricklypear, and was relatively static. These data suggest that blue gram is declining slightly, while needle-and – thread is static, and Sandberg bluegrass, pricklypear, and ringed sagewort are slowly increasing. At this site, the IDT observed short and stable water flow patterns, rare active pedestalling, small bare areas that were rarely connected, movement of small size classes of litter, slightly reduced soil resistance to erosion, and historic soil loss. The IDT, also, noted a shift in plant community composition and functional/structural groups toward blue grama and pricklypear, with few bunchgrasses or shrubs, which has reduced infilitration, annual production, litter amounts, and reproductive capability of perennial plants. Black henbane was found at water troughs and along road. The remaining indicators matched what was expected for the ecological site.

At another site within the Block Mountain pasture, the IDT noted good distribution of litter with little movement, a slight reduction in soil resistance to erosion, slight soil loss, a shift in

community composition and distribution and functional/structural groups with larger interspaces between bunchgrasses than expected and abundant blue grama and pricklypear, some decadence in the bunchgrasses and rabbitbrush, a slight reduction in litter, lots of seedheads on perennial plants, and leafy spurge in pockets along the ridge. The remaining indicators matched what was expected for the ecological site. As a whole, upland resources within the Block Mountain pasture are properly functioning with opportunity for improvement.

In the Bronx pasture, vegetative canopy cover was 29% and comprised, primarily, of blue grama, needle-and-thread, and Sandberg bluegrass. The IDT observed short and stable water flow patterns between mats of blue grama, some active pedestalling and terracettes, movement of small size classes of litter, no soil organic layer, evidence of soil loss, a shift in plant community composition favoring blue grama and half-shrubs over shrubs and bunchgrasses, which reduces infiltration, moderately reduced annual production, litter amount, and reproductive capability of perennial plants. The remaining indicators matched what was expected for the ecological site. Upland resources in the Bronx pasture are functioning at risk and appear static.

Trend monitoring data from the North Big Schulz pasture indicate that vegetative canopy cover was 28% and was dominated by bluebunch wheatgrass, fringed sagewort, Sandberg bluegrass, and broom snakeweed. The IDT observed water flow patterns that were mostly short and stable, but some with connectivity and instability, active pedestalling and terracette formation, connected bare areas, gullies that were revegetating and stable, movement of small size classes of litter, a slight reduction in soil resistance to erosion, and soil loss in plant interspaces. Other observation included a shift in plant community composition, plant distribution, and functional/structural groups toward excessive blue grama, pricklypear, fringed sagewort, and broom snakeweed, which has resulted in moderately large interspaces between bunchgrasses and reduced annual production, litter amount, and reproductive capability of perennial plants. The remaining indicators matched what was expected for the ecological site. Trend monitoring data suggests that cool-season bunchgrasses may be slowly improving, but overall, the upland resources in this pasture are functioning at risk with a relatively static trend.

McCullough Individual – The McCullough Individual allotment is managed in a custodial manner and grazed in conjunction with the adjacent private property, however, grazing use is authorized during the dormant season (November 1 – November 30), annually. Vegetation on this allotment varies from blue grama and needle-and-thread on the bench to bluebunch wheatgrass, Sandberg bluegrass, and Wyoming big sagebrush on the foothills. The upland resources on this allotment are functioning properly under current management.

Richards – The Richards allotment is managed by deferring livestock use (July 1 – September 30) and alternating use between the two pastures. The IDT's observations included short and stable water flow patterns, slight active pedestalling, gullies that were revegetating and stable, and infrequent blowout areas. Additionally, there was no organic layer with signs of some soil loss, a shift in community composition and functional/structural groups toward blue grama and pricklypear, reduced annual production and litter, and a slight reduction in reproductive capability. The remaining indicators matched what was expected for the ecological site. The Richards allotment is properly functioning under current grazing management.

Seyler Pasture – The Seyler Pasture allotment is grazed during the dormant season (October 1 – April 15), which was implemented following the previous assessment, in 2004. Prior to that, the allotment was grazed for the entire growing season. Total vegetative canopy cover ranged from 18 to 22%. While the herbaceous community is still dominated by blue grama and needle-and-thread, the IDT noted an improvement in the vigor and reproductive capability of the cool-season bunchgrasses within the allotment. Other IDT observations included some active pedestalling, slightly more bare ground than expected, some soil surface loss and reduced resistance to erosion in plant interspaces, a shift in community composition an functional/structural groups that is moderately affecting infiltration and runoff, and a reduction in annual production and litter amount. The remaining indicators matched what was expected for the ecological site. The IDT noted that upland resource conditions on this allotment are slowly improving under current management.

Triangle – The Triangle allotment is managed in a custodial manner and grazed in conjunction with the adjacent private property. It appears that this parcel has been used for feeding harvested forage during the winter months, which has severely impacted the vigor, production, and reproductive capability of the herbaceous community, as well that of sagebrush and rabbitbrush. Due to the impacts to the vegetative community, the IDT classified the upland resources within this allotment as functioning-at-risk with a static to downward trend.

Recommendations

1. Continue existing livestock grazing management on the Dancehall Custodial, Devil's Dancehall, Logan Smith, McCartney Mountain North, McCullough Individual, Richards, and Seyler Pasture allotments.

2. Revise grazing management to incorporate more frequent rest, deferred use, and/or shorten the grazing period within pastures where resource concerns were identified on the Camp Creek, Garrison, and McCartney Mountain South allotments.

3. Shorten grazing period, vary season of use, and incorporate rest on the Buhrer allotment.

4. Rest the Triangle allotment for several years to evaluate the natural resiliency of the native vegetation. Emphasize and enforce that supplemental feeding is not permitted on BLM-administered lands.

Riparian and Wetland Areas

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

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 (USDI 1998; USDI 1999), 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, while 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 (USDI 2001) is also used for springs. These technical references are available online at http://www.blm.gov/nstc/library/techref.htm.

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 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 uses the Rosgen Stream Classification System as a tool to help determine stream potential (Rosgen 1994; Rosgen and Silvey 1998). This system has gained wide recognition throughout the United States and abroad. A major benefit of the system is the ability to determine stream sensitivity and to predict channel evolution with some level of accuracy (Rosgen 1996).

During the summer of 2013, the IDT assessed 25 stream reaches, flowing through approximately 18.34 miles of BLM-administered land, visited most of the springs and wetlands within the watershed, and completed PFC evaluations on each. Applicable portions of the lentic methodology were used to assess springs and wet meadows.

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. Conversely, several stream reaches, springs and wetlands not previously identified, were assessed and added to the BLM riparian-wetland data base during the assessment process.

Data were collected on all the streams in the SWHW using the Montana Riparian Wetland Assessment (MRWA) 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 SWHW. Riparian coverboards were established in the SWHW in the 1980's. Coverboard data measures relative change in canopy cover of woody species in the riparian zone. Greenline data measures 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 provide a photographic record of changes over time. All the monitoring data used to aid the IDT in its assessment are included in the SWHW project file and available for review at the Dillon Field Office.

Affected Environment

As mentioned previously, the assessment area encompasses approximately 120,000 total acres, of which about 72,000 acres are public lands administered by the BLM. The assessment area is mainly within the Middle and Lower Big Hole Hydrologic Units.

Streams
Stream flow in the SWHW fluctuates annually and seasonally in response to precipitation in the form of rain and snow. The major streams within the SWHW are Camp Creek, Rochester Creek and Soap Gulch.

Springs and Wetlands
Numerous isolated springs and small 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).

In response to limited water resources within the watershed, the BLM through the Rangeland Improvement Program has constructed 25 water developments. Springs are the predominant water source, though some wells have also been drilled. These spring developments and their associated wetlands were inventoried and assessed and are listed and described in the Findings, Analysis and Recommendations section.

National Wetland Inventory
The National Wetlands Inventory has not been completed in Montana. The State of Montana established the Montana Wetland and Riparian Mapping Center in 2007 to address this problem. The BLM is assisting in funding this project. The Montana Natural Heritage Program is using National Agricultural Imagery Program (NAIP) imagery to inventory and map Montana's wetland and riverine resources. According to the Montana Natural Heritage Program, as of

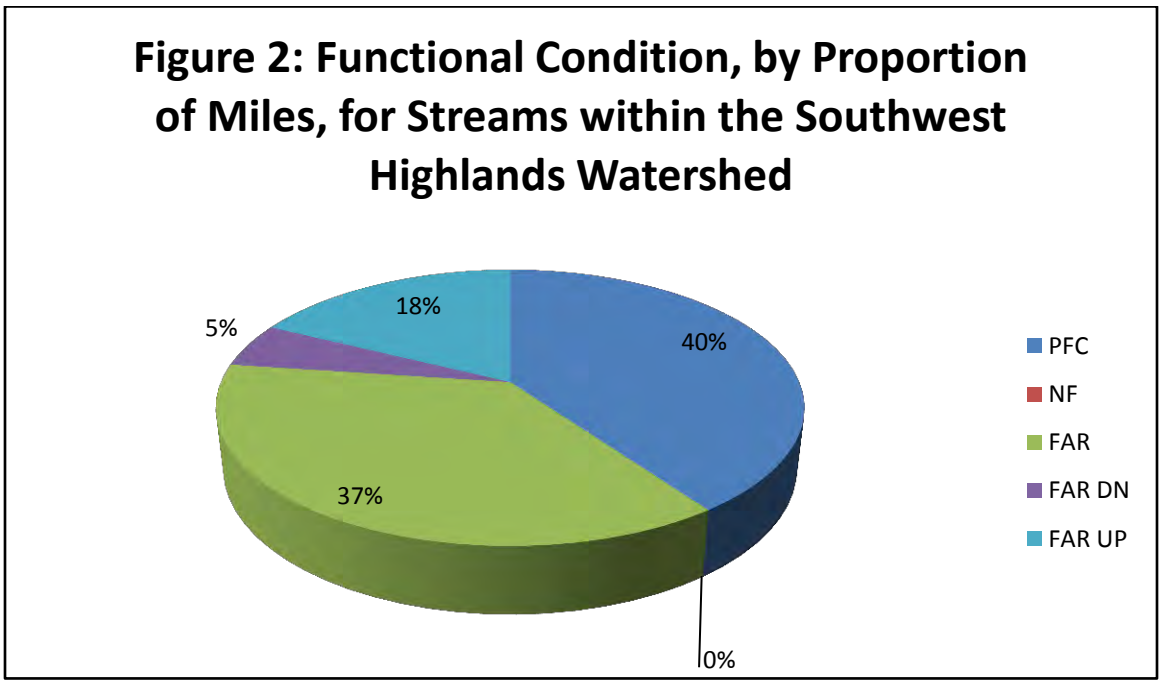
October 2013, provisional mapping has been completed for the SWHW assessment area. Once the US Fish and Wildlife Service verifies and approves the provisional NWI mapping, the public and the BLM will have a more comprehensive database and the capability to do more thorough analyses.

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 and Analysis

This is the second watershed-scale assessment completed in the Southwest Highlands. During the first assessment, in 2003, 25.7 miles of streams were assessed, but developed springs were not inventoried or assessed. According to the 2003 Southwest Highlands Assessment Report, 12.5 miles were PFC or FAR-Up and 13.2 miles were NF, FAR static, down or not apparent.

Streams
During the 2013 assessment, 16 reaches were removed from the database either because they were ephemeral, were wetlands, not streams, or ran through private property. Ultimately, 25 reaches totaling 18.34 miles were assessed. Of those stream reaches, nine reaches (7.36 miles) were rated PFC and five reaches (3.24 miles) were rated FAR with an upward trend. Ten reaches (6.79 miles), were rated FAR with a static or not apparent trend and one reach (0.95 miles) was rated FAR with a downward trend. No reaches were rated NF. The proportion of total stream miles rounded to whole miles in each functional class is illustrated in Figure 2. The locations and functional class ratings for streams in the SWHW are also illustrated on Map 4.



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. Ungulate trailing, trampling, grazing and browsing were dominant causal factors. Roads, historic mining and culverts were also causal factors, to varying degrees.

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 goal is to promote conditions that enhance a streams ability to maintain stable dimensions, patterns and profiles. Table 5 summarizes the functional status of all the surveyed stream reaches across five allotments in the SWHW.

Table 5. Functional status of stream reaches within the Southwest Highlands Watershed.

Stream Name	Allotment	BLM Reach ID	Vegetative Community Type	Functional Rating & Trend*	Miles
Camp Creek	Camp Creek	550	Geyer willow	PFC	0.75
Camp Creek	Camp Creek	551	Geyer willow	FAR	1.36
Camp Creek	Camp Creek	552	Geyer willow	PFC	1.15
Camp Creek	Camp Creek	585	Geyer willow	PFC	0.51
Camp Creek trib.	Camp Creek	554**	Quaking aspen/ Red-osier dogwood	PFC	0.76
Camp Creek trib.	Camp Creek	555**	Geyer willow	PFC	0.28
Camp Creek trib.	Camp Creek	BHMR-3 U (556)[1]	Beaked sedge	FAR	0.21
Camp Creek trib.	Camp Creek	BHMR-3 L (557)	Quaking aspen/Red-osier dogwood	FAR Up	0.50
Camp Creek trib.	Camp Creek	BHMR-4 (558)	Quaking aspen/Red-osier dogwood	FAR	0.54
Camp Creek trib.	Camp Creek	BHMR-5	Quaking aspen/Red-osier dogwood	PFC	0.50
Moffet Gulch	Camp Creek	574	Beaked Sedge	FAR	0.52
Rochester Creek	Camp Creek	567	Beaked sedge	FAR-Dn	0.95
Rochester Creek	Camp Creek	568	Beaked sedge	FAR Up	0.82
Rochester Creek	Camp Creek	569	Beaked sedge	FAR Up	0.87
Soap Gulch	Camp Creek	BHMR-9	Narrow leaf cottonwood/Red-osier dogwood	PFC	0.90
Soap Gulch	Camp Creek	BHMR-10	Douglas fir/Red-osier dogwood	FAR	0.69
Soap Gulch	Camp Creek	BHMR-11	Douglas fir/Red-osier dogwood	FAR	2.40
Left Fork Soap Gulch	Camp Creek	BHMR-12	Beaked sedge	FAR-Up	1.00
Soap Gulch trib.	Camp Creek	BHMR-13	Geyer willow/Beaked sedge	FAR	0.31
Timber Canyon	Devils Dancehall	579	Geyer willow/Beaked sedge	FAR	0.21

Stream Name	Allotment	BLM Reach ID	Vegetative Community Type	Functional Rating & Trend*	Miles
Timber Canyon	Devils Dancehall	586	Geyer willow/Beaked sedge	FAR	0.15
Buher Gulch	Garrison	564	Water birch	FAR-Up	0.05
Buher Gulch	Garrison	581	Beaked sedge	FAR	0.40
Rochester Creek	Logan Smith	565	Yellow willow/Beaked sedge	PFC	0.65
Rochester Creek	Seyler Pasture	566	Geyer willow/Beaked sedge	PFC	1.86

[1] A stream with a BLM Reach ID presented in parentheses indicates that the reach was assigned numbers by both the Butte and Dillon Field Offices. These are being reconciled through the assessment process.

Camp Creek – The Camp Creek allotment includes Camp Creek, Soap Gulch, Rochester Creek, Wickiup Creek, and their tributaries (19 reaches) totaling 15.02 miles. Of these reaches, six (4.85 miles) were rated PFC, four (3.19 miles) were rated FAR Up, seven (6.03 miles) were FAR and one (0.95 mile) was FAR Dn.

Camp Creek and its tributaries are comprised of ten reaches. Along reaches 550 and 585, the upland watershed was not contributing to riparian-wetland degradation for the most part, sediment was observed at some crossings and access points. Spotted knapweed, black henbane, and cheatgrass were observed below the reservoir between the stream and ditch (Reach 550). Based on the MRWA inventory, reach 552 was well-armored by Booth, Bebb, and Geyer willows and was largely inaccessible to livestock. Minor streambank alteration was occurring along a fence crossing and in close proximity to the road. BHMR-5 has been manipulated by past mining activity, which has altered its potential, and receives sediment from the adjacent road. These reaches were rated as PFC.

Along reach 551, the IDT observed over-widening in areas accessible to livestock, areas of insufficient vegetation to protect banks, blown out beaver dams, and excessive browsing, which is impacting the vigor of woody species. This reach was rated as FAR-Static.

Along BHMR-3 (556 & 557) and BHMR-4 (558), the IDT noted over-widening from livestock trailing. BHMR-3 also exhibited diminished recruitment of deciduous riparian vegetation, due to browsing by ungulates and shading by conifers. The MRWA inventory for reach 556 also noted sediment from the road and culvert problems. BHMR-4 is also over-widened by historic mining activity, with lots of mine and mill tailings, and appears to have been manipulated numerous times. Additionally, the road runs adjacent to much of the reach. The IDT rated BHMR-3 L (557) as FAR-Up, while BHMR-3 U (556), and BHMR-4 were rated FAR-Static.

Reaches 554 and 555 are unnamed tributaries to Camp Creek and, though dry in 2013, previously had base flow. There are numerous aspen along these spring-fed, low-energy systems that originate below a mill site, before proceeding down the draw. The road is located in the bottom of the draw and likely contributes sediment during high-runoff events. Considering their potential, these reaches were rated as PFC.

Moffet Creek (574), a tributary of Wickiup Creek, is a low-energy system that is over-widened and heavily grazed, which is impacting channel morphology and vegetative vigor. The IDT rated this reach FAR static due to livestock impacts.

There are five stream reaches in Soap Gulch (BHMR-9 through BHMR-13). BHMR-9 occurs within a livestock exclosure and is deeply entrenched due to historic mining activity. The IDT noted that the gully plugs are trapping sediment and facilitating the formation of a new floodplain and the reach was rated PFC. While not affecting functionality, there numerous noxious weeds along the reach.

Along BHMR-10, noxious weeds were present throughout the reach and there was conifer encroachment in the riparian area and into adjacent stands of curl-leaf mountain mahogany. Observations for BHMR-11 and BHMR-12 included conifer encroachment throughout the reach, over-widening due to livestock trailing, and the inability of this low-energy system to move the excessive sediment being contributed by the roads and from historic mine tailings and mining activity. Similar observations were made along BHMR-13, except that headcuts were observed near the culvert, in T. 1 S., R. 8 W., Sec. 28, and that conifer encroachment was not a concern. BHMR-10 and BHMR-11 were rated as FAR-Static, BHMR-12 was rated as FAR-Up, and BHMR-13 was rated as FAR with an unapparent trend.

Within the Camp Creek allotment, Rochester Creek consists of three reaches (567, 568, & 569). Reach 567 runs through a patent and has an active mining operation that has failing and inadequate BMPs in place and is resulting in increased sediment input to the stream. This reach was rated FAR with a downward trend. Reaches 568 and 569 are over-widened, but show some evidence of narrowing and sedges being recruited along the greenline. Rest has been incorporated into the grazing system, which has reduced livestock impacts allowing these reaches to show improving trends. These reaches were rated FAR with an upward trend.

Devils' Dancehall – In Timber Canyon, on the Devil's Dancehall allotment, there are two reaches (579 & 586), essentially springs and spring brooks, totaling 0.36 miles. The IDT observed that the sinuosity, width depth ratio, and gradient are not in balance with the landscape setting due to livestock trailing and loafing in the riparian areas and rated both reaches as FAR static.

Garrison – Within the Garrison allotment, there is one stream, which flows through Buhrer Gulch. The stream is divided into two reaches, 564 and 581. In 2005, reach 564 was excluded from livestock grazing. This reach rated as FAR but is showing measurable improvement. Reach 581 is located upstream from the exclosure, in the gulch, and is heavily impacted by livestock grazing and trailing, resulting in over-widening of the channel as well as impacts to the vegetation. Reach 581 was rated as FAR static.

Logan Smith – Rochester Creek, reach 565, flows through the Logan Smith allotment. Historically, this reach was deeply entrenched from mining activity and still receives excess sediment from the adjacent road. Based on the MRWA inventory, the streambanks are well-armored by willows, sedges, and rushes, the stream is forming a new flood plain, and the riparian area is widening. Reach 565 was rated as properly functioning.

Seyler Pasture – Rochester Creek (566) flows through the Seyler Pasture allotment. This stream is reforming its channel; however, recent maintenance of the adjacent road is contributing excessive sediment to the stream. At present, the stream appears to accommodating the sediment. The IDT also noted that aspen, cottonwoods, and willows were browsed and there was some decadence in the willows, but overall, the stream was functioning properly.

Developed Springs

The BLM's Rangeland Improvement Project System (RIPS) database shows 25 spring developments in the SWHW. The IDT visited these developments to determine resource condition, condition of infrastructure, and water production (flow). Spring developments originating on private land with troughs on Public Land are not listed or shown.

Table 6. Developed springs within the Southwest Highlands Watershed.

Spring Name	Project Number	Allotment	Constructed
Barrel Spring	476402	Camp Creek	1941
Camp Creek Springs	476947	Camp Creek	1987
East Klondike Spring	476529	Camp Creek	1984
Gooseberry Spring	470009	Camp Creek	1984
Midway Spring	470244	Camp Creek	1950
Moose Camp Spring	470250	Camp Creek	1951
Moose Camp Spring #2	470644	Camp Creek	1966
Moose Camp Spring #3	474838	Camp Creek	1966
Old Cabin Spring	477042	Camp Creek	1987
Old Glory Spring	001771	Camp Creek	2006
Reid Spring	470448	Camp Creek	1962
Soap Gulch Spring and Pipeline	477279	Camp Creek	1993
Soapy Spring	470645	Camp Creek	1968
Twin Trees Spring	470007	Camp Creek	1940
Box Spring	470212	Garrison	1944
Buhrer Spring	000802	Garrison	2005
Choke Cherry Spring	470196	Garrison	1940
Garrison Spring	470195	Garrison	1940
Lost Horse Spring	470203	Garrison	1944
Mill Spring	000803	Garrison	2005
Muller Spring	470059	Garrison	1957
Reservoir Spring	470042	Garrison	1941
Unnamed Spring in Sandy Hollow*	N/A	McCartney Mountain South	No Record
Smith Section 14 Spring	476420	Logan Smith	1983
Upper Sheep Camp Spring	477377	McCartney Mountain North	No Record
Lower Nez Perce Spring	470070	Seyler Pasture	1941

*This is an unauthorized development and is discussed below.

Maintenance of water developments was a noted concern at several developments across the watershed. Maintenance problems encountered with specific water developments 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 function as Best Management Practices. 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.

Spring Conditions by Allotment

Those springs that are not specifically mentioned below are generally being well maintained and are functioning.

Camp Creek – There are 14 springs in the Camp Creek allotment, many of which have been redeveloped in recent years. Barrel Spring, also, has an associated spring brook that terminates in a dry wash. The dry wash is accessible from State Land, in T. 2 S., R. 8 W., Sec. 16 on the Camp Creek Road, and is used by off road vehicles, which, along with livestock trailing, have resulted in over-widening.

Camp Creek Spring is a complex of five springs, several of which have livestock exclosures. At one of these springs, which was not protected, livestock impacts were observed. The Moose Camp Springs were not fully evaluated. Moose Camp Spring, Project No. 470250, is located on reach BHMR-13 and is fenced in with the adjacent USFS Moose Camp allotment. File notes for Moose Camp Spring #2 and #3 indicate deterioration of infrastructure and grazing impacts to the resources. Reid and Midway Springs are not producing water and the troughs have rusted out. The trough at East Klondike spring is no longer level and is overflowing. The infrastructure at Twin Trees Spring has deteriorated and is not functioning effectively.

Garrison – There are eight spring developments in the Garrison allotment. Of those, Box, Buhrer, Chokecherry and Mill Springs have good flow and are being maintained. The IDT noted infrastructure and resource concerns at Garrison, Lost Horse, Muller, and Reservoir Springs, including dysfunctional troughs and pipelines and livestock impacts to spring sources.

Logan Smith – There is one water development, Smith Section 14 Spring, in this allotment. The spring is not producing any water and no evidence of hydric soils or hydrophytic vegetation was found during the most recent site inspection.

McCartney Mountain North – Upper Sheep Camp Spring is located in the McCartney Mountain North allotment. The BLM project file does not contain a history for this spring and it appears that the spring was part of a land exchange. The spring source is in good condition, has good flow (5 gpm), and the trough, which is located on BLM-administered land, is well maintained.

McCartney Mountain South – The IDT visited an unauthorized spring development in Sandy Hollow, within the McCartney Mountain South allotment. This spring provides an important water source in an otherwise dry part of the allotment, but the project is poorly designed and barely functioning. Although a small livestock exclosure protects the springbox, the spring source is not fully protected and livestock impacts are evident.

Seyler Pasture – Lower Nez Perce Spring is the only spring development in the Seyler Pasture Allotment. This spring is located within the Twin Bridges SW 7.5 minute Quadrangle. No wetlands are shown on the Montana Natural Heritage Provisional Wetland maps and indeed no evidence of hydric soils or hydrophytic vegetation was observed during a recent site inspection. The water table has lowered and the spring has dried up.

Recommendations

1. Revise livestock management in the Camp Creek, Devil's Dancehall and Garrison allotments to mitigate impacts to riparian/wetland habitat. Consider changes in timing, duration, frequency and/or intensity of use as well as number and/or kind of livestock. Incorporation of rest, and where applicable extended rest, into a grazing systems as well as structural projects should be considered to mitigate resource concerns.

2. 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 removed. Livestock exclosures should be constructed, maintained, reconstructed or removed depending on resource needs.

3. Conduct an engineer's evaluation of the road and culvert adjacent to reach 556 and address findings as appropriate.

4. Specific spring related recommendations include:
    a. Camp Creek Allotment – Clean-up and abandon Midway and Reid Springs. Upgrade and reset the trough associated with east Klondike Spring. Have engineering staff and resource specialists evaluate the Moose Camp Springs and Twin Trees Spring to determine feasibility of redevelopment or cleanup and abandonment.
    b. Garrison Allotment – Garrison, Lost Horse, Muller, and Reservoir Springs should be evaluated by engineering staff and resource specialists to determine feasibility of redevelopment and resource protection needs.
    c. Logan Smith Allotment – Smith Section 14 Spring should be evaluated by engineering staff. The preliminary recommendation is that it be abandoned and the materials removed.
    d. McCartney Mountain South – The unauthorized spring development in Sandy Hollow needs to be authorized and maintained or removed.
    e. Seyler Pasture Allotment – Remove the infrastructure and abandon Lower Nez Perce Spring.

Water Quality

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

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 non-point source (NPS) water pollution. 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 effects 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 (MTDEQ 2007). A memorandum of understanding between the BLM and MTDEQ (USDI 2010) documents the BLM's strategy for managing and controlling nonpoint source 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 (BMP). 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.

Affected Environment

The 1987 Amendments to the Clean Water Act require States to develop plans for controlling non-point sources of water pollution. Montana has divided the State into water quality planning areas and the SWHW assessment area is located within the Lower Big Hole TMDL Planning area. The Montana-Dakotas BLM, through a Memorandum of Understanding, works with the State of Montana to control non-point source water pollution. Guiding documents used to describe the affected environment include the Middle and Lower Big Hole Planning Area TMDLs and Water Quality Improvement Plan (MTDEQ 2009), Montana's Water Quality Integrated Report (MTDEQ 2012a), and the Montana Nonpoint Source Management Plan (MTDEQ 2012b). It should be noted that the scope of the TMDLs addressed by the Water Quality Improvement Plan include sediment, nutrients, metals and temperature related water quality impairments.

The DEQ's Water Quality Integrated Report identifies seven major land uses that contribute significantly to nonpoint source pollution. Many of these land uses occur on BLM managed land: grazing, silviculture, unpaved roads, flow alterations from irrigation and abandoned mine lands. The 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 2012a).

Nonpoint source water pollution affects water quality regardless of whether the stream is on the 303-d list of streams requiring TMDLs; nonpoint source 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. Some of the streams within the SWHW are tributary streams and are not listed.

Findings and Analysis

Montana DEQ has water quality reports for the following creeks and rivers in the Southwest Highlands Watershed: Big Hole River (included as it is the receiving water for many of the streams in the SWHW), Camp Creek, Rochester Creek, Soap Creek, and Wickiup Creek (Clean Water Act Information Center (CWAIC) website). Table 7 provides CWAIC information. TMDLs have been prepared for some but not all pollutants.

Table 7: Montana DEQ 303-d Listed Streams within the Southwest Highlands Watershed.

Name	Beneficial Uses	Probable Sources of Impairment	Probable Causes of Impairment
Big Hole River Divide to mouth - Jefferson	Agriculture[1], Aquatic Life [2], Cold Water Fishery [n/a], Drinking Water [2], Industrial [n/a], Primary Contact Recreation [2]	Acid mine drainage, Impacts from abandoned mines, Irrigated crop production, Dam construction, Grazing in Riparian or Shoreline Zones, Highways, Roads, Bridges, Infrastructure.	Cadmium, Copper, Lead, Zinc, Low flow alterations , Physical substrate habitat alterations, Temperature, water.
Camp Creek Headwaters to mouth	Agriculture[2], Aquatic Life [2], Cold Water Fishery [n/a], Drinking Water [2], Industrial [n/a], Primary Contact Recreation [2]	Impacts from abandoned mine lands, Grazing in Riparian or Shoreline Zones, Irrigated crop production, Unpaved Roads.	Arsenic, Nitrogen (Total), Phosphorous (Total), Alteration in streamside or littoral vegetative covers, Low flow alterations. Sedimentation/siltation
Rochester Creek	Agriculture[1], Aquatic Life [2], Cold Water Fishery [n/a], Drinking Water[2], Industrial [n/a], Primary Contact Recreation[1]	Impacts from abandoned minelands, Subsurface (Hardrock) mining, Grazing in Riparian or Shoreline Zones.	Arsenic, Copper, Lead, Mercury, Physical habitat substrate alterations, Sedimentation, siltation.
Soap 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, Irrigated crop production, Unpaved roads.	Nitrogen (Total), Phosphorous (Total), Alteration in streamside or littoral vegetative covers, Sedimentation/siltation
Wickiup Creek	Agriculture[1], Aquatic Life [2], Cold Water Fishery [n/a], Drinking Water [2], Industrial [n/a], Primary Contact Recreation [1]	Subsurface (Hardrock) mining, Grazing in Riparian or shoreline Zones, Forest Roads (Construction and use.)	Copper, Lead, Mercury, Phosphorous (Total), Alteration in streamside or littoral vegetative covers, Bottom sediments.

[1] Fully Supporting, [2] Not Supporting,

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 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 source pollution. 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 zmanagement 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 SWHW assessment, the IDT used a combination of methodologies to evaluate the watershed characteristics, as well as condition and function of floodplains, springs, streams and their associated riparian areas, and wetlands.

In conducting watershed assessments with respect to nonpoint source 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 (ability to transport sediment), 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 number of stream miles in the Dillon Field Office, temperature monitoring is limited to selected streams and is currently conducted by the fisheries biologist. The PFC assessments also provide clues to stream temperature. Shallow, over-widened 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. The assessment team also looks for evidence of current and historic mining, abandoned beaver dams, erosion from roads, and concentrated livestock waste.

Of the 12 allotments within the SWHW, only five have streams and AMPs have been developed for four of those allotments. In 2004, the BLM initiated or revised grazing management for the Garrison and Seyler Pasture allotments. Grazing management on the Camp Creek allotment was revised in 2005. In 2003, land health standards were met on the Devil's Dancehall and Logan Smith allotments and grazing management was not changed.

During the 2013 field assessments, using the PFC assessments as an indicator of AMP/BMP effectiveness, the IDT found that, under current management, resource conditions within the Seyler Pasture allotment are improving; and static to improving in the Logan Smith allotment, indicating that BMPs on these allotments are effective. Based on IDT observations within the

Camp Creek, Devil's Dancehall, and Garrison allotments, the current BMPs are not effective and need revision.

In addition to the AMPs, there are numerous water developments in the watershed assessment area. Some of these were well designed and working effectively, while others were in need of repair or were not providing water. Road maintenance including culvert sizing and installations are also evaluated. Discussions of resource concerns found at water developments and specific roads and culverts are included above in the Riparian Health section.

Refer to the sections on upland health, riparian/wetland health, and biodiversity (forestry), and for BMP effectiveness, 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

1. Continue working with Montana DEQ and the Big Hole Watershed Committee to implement the Middle and Lower Big Hole Planning Area TMDLs and Water Quality Improvement 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.

Air Quality

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

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.

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 Butte 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 SWHW 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 SWHW can be affected by fires located far from the SWHW. Because pollutant emissions associated with wildfires are largely beyond human control, exceedances 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 to the SWHW is Dillon, Montana, located within Beaverhead County. In 2010, the City of Dillon's population was 4,134 (USDC 2010a), while Beaverhead County's population was 9,246 (USDC 2010b).

Findings and Analysis

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 concern 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

1. 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."*

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 and condition of available habitat to determine the condition/function of biodiversity. The wildlife habitat niches expected are: grasslands (short and mid grasses), bare ground, small streams, rivers, riparian/wetlands, sagebrush steppe, mahogany stands, conifer forests, aspen and cottonwood stands, and various mixes of these components.

Because of the complexities involved with addressing the Biodiversity Standard, the Affected Environment and Findings and Analysis are presented together, primarily by habitat, and Recommendations are presented at the end of the section.

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.

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; State-listed species; and sensitive species designated by the BLM State Director (USDI 2009). These species are managed in accordance with BLM Manual 6840 – Special Status Species Management (USDI 2008). Providing habitat for special status plant and animal species is integral to meeting the biodiversity standard. Table 8 below identifies the special status species known to occur in the SWHW.

Greater sage grouse are currently listed as a candidate species under the ESA (USFWS 2010), as the FWS determined that listing was warranted, but precluded by other priority listing actions. This emphasizes the importance of managing for, and maintaining the integrity of, all seral stages within sagebrush habitats on public lands, not only for sage grouse, but for all sagebrush-obligate species. The SWHW includes approximately 53,300 acres of preliminary general management areas (PGMA) for sage grouse (Schroeder et al. 2004) (Map 2). Much of the habitat identified as PGMA are sagebrush habitats that may or may not be currently supporting sage grouse. No primary management areas have been identified within the SWHW.

The Northern Rocky Mountain population of gray wolves, including Montana wolves, was delisted from the list of Endangered and Threatened Wildlife on May 5, 2011 as part of the Appropriations Act that was signed in April, 2011. Therefore, gray wolves are now a BLM sensitive species and are identified as a "species in need of management" under jurisdiction of MTFWP.

The bald eagle was removed from the Federal List of Threatened and Endangered Species in August, 2007. Bald and golden eagles are still protected under the Bald and Golden Eagle Protection Act, and are BLM sensitive species.

Long-eared myotis, long-legged myotis and Townsend's big eared bats are BLM sensitive species and have been documented in the SWHW. The rocky crags and escarpments associated with forest and woodlands along Soap Gulch and Camp Creek provide suitable roosting habitat and the drainages provide foraging areas for insects. Abandon mine adits and shafts have also been as documented providing roosting habitat for bats in the SWHW.

Table 8. Special status species known to occur within the Southwest Highlands Watershed.

Wildlife Species	Current Management Status	Occurrence*	Preferred habitat
Greater Sage Grouse (*Centrocercus urophasianus*)	Candidate	R	Sagebrush shrubland
Bald Eagle (*Haliaeetus leucocephalus*)	Sensitive	R	Riparian/wetland
Black-backed Woodpecker (*Picoides arcticus*)	Sensitive	R	Forest

Wildlife Species	Current Management Status	Occurrence*	Preferred habitat
Brewer's sparrow *(Spizella breweri)*	Sensitive	R	Sagebrush shrublands
Ferruginous Hawk (*Buteo regalis*)	Sensitive	R	Sagebrush shrubland
Gray Wolf (*Canis lupus*)	Sensitive	R	All
Great Basin pocket mouse *(Perognathus parvus)*	Sensitive	R	Sagebrush shrubland
Great Gray Owl (*Strix nebulosa*)	Senstive	R	Forest
Golden Eagle *(Aquila chrysaetos)*	Sensitive	R	Riparian/wetland Sagebrush shrubland
Loggerhead Shrike (*Lanius ludovicianus*)	Sensitive	R	Sagebrush shrubland
Long-billed Curlew (*Numenius americanus*)	Sensitive	R	Grassland
Long-eared Myotis *(Myotis evotis)*	Sensitive	R	Grassland/woodland
Long-legged myotis *(Myotis volans)*	Sensitive	R	Forest/ Riparian
McCown's longspur *(Calcarius mccownii)*	Sensitive	R	Grasslands
Northern Goshawk *(Accipiter gentilis)*	Sensitive	R	Forest
Peregrine Falcon *(Falco peregrinus anatum)*	Sensitive	R	Riparian/wetland
Sage thrasher *(Oreoscoptes montanus)*	Sensitive	R	Sagebrush shrubland
Swainsons Hawk (*Buteo swainsoni*)	Sensitive	R	Riparian/wetland Sagebrush shrubland
Three-toed Woodpecker (*Picoides tridactylus*)	Sensitive	R	Forest
Townsend's Big-eared Bat (*Corynorhinus townsendii*)	Sensitive	R	Forest
Plant Species	**Current Management Status**	**Known from BLM lands?**	**Preferred habitat**
Idaho fleabane (*Erigeron asperugineus*)	Sensitive	Yes	Windswept, rocky or gravelly slopes and ridges, often on limestone-derived soils.
Lesser Indian paintbrush (*Castilleja minor ssp. minor*)	Sensitive	No	Moist alkaline meadows.
Mojave brickellbush (*Brickellia oblongifolia*)	Sensitive	Yes	Rock outcrops, talus and scree, and on dry, sparsely-vegetated, southerly slopes.
Tree Species	**Current Management Status**	**Known from BLM lands?**	**Preferred habitat**
Whitebark pine (*Pinus albicaulis*)	Candidate	No	High elevation sub-alpine zone

*Resident (R), Transient (T)

Sagebrush Habitats and Sagebrush Dependent Species
Sagebrush and grassland habitat types make up 84% of BLM administered lands in the SWHW. Of this, 83% is in the sagebrush/mountain shrub cover type and <1% is grassland. The dominate sagebrush species in the watershed are Wyoming big sagebrush and mountain big sagebrush. Intermingled occurrences of basin big sagebrush, three-tip sage and low sage add to the diversity of vegetation and habitat structure. The variety of sagebrush provides habitat for pronghorn, mule deer, sage grouse and a suite of bird species while providing crucial winter range for sage grouse and big game species.

Important sage grouse seasonal habitat is centered on breeding and winter complexes. Brood rearing habitats require a mix of forbs and insects for a high protein diet, usually in association with riparian habitats adjacent to sagebrush habitat. Winter diets consist of almost 100% sagebrush.

Idaho fleabane and Mojave brickellbush 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 SWHW face no anthropogenic threats.

Fuels treatments designed to remove conifer colonization into sagebrush habitats and create fuel breaks to defend against wildfire were implemented in the SWHW between 2006 and 2012 (see below). These projects were successful in removing conifers and creating early seral conditions to maintain sagebrush grassland and have recruited sagebrush back on these sites

Riparian, Aquatic and Wetland Habitat and Associated Species
The SWHW contains one perennial stream (Camp Creek) on BLM administered land that supports a viable fishery. Sport fish species found in the assessment area are brook trout (*Salvelinus fontinalis*) and rainbow trout (*Oncorhynchus mykiss*). One native species, mottled sculpin (*Cottus bairdi*), is common to the drainage.

Lesser Indian paintbrush prefers moist alkaline meadows in the valley zone. It has not been documented on BLM administered lands within the SWHW, but it is documented on private lands within the watershed.

Riparian/mesic shrubs make up 1% of the BLM administered lands in the SWHW. Riparian areas provide important habitat for moose, elk, beaver, songbirds, and sage grouse. 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.

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).

Generalists or widespread species

Big game species and carnivores are more widespread and use all habitat types during all or part of the year. Due to seasonal migrations they may be found on traditional winter ranges and during the summer, dispersed throughout the watershed. The primary game species and their associated habitats are listed in Table 9.

Table 9. Primary game species and habitat use within the Southwest Highlands Watershed.

Species	Forested	Sagebrush/shrubland	Riparian
Bighorn sheep *(Ovis canadensis)*		**Y**	**Y**
Black Bear *(Ursus americanus)*	**Y**	**S**	**S**
Dusky grouse *(Dendragapus obscurus)*	**Y**		**Y**
Elk *(Cervus canadensis)*	**S,C**	**W,C**	**Y**
Moose *(Alces americanus)*	**Y**	**Y**	**Y**
Mountain Lion *(Puma concolor)*	**Y**		**Y**
Mule deer *(Odocoileus hemionus)*	**S,C**	**W,C**	**W**
Pronghorn Antelope *(Antilocapra americana)*		**Y**	
Greater sage grouse (*Centrocercus urophasianus*)		**Y**	**B**
White-tailed deer *(Odocoileus virginianus)*			**Y**

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

The SWHW lies in Hunting District (HD) 75 for bighorn sheep. Curl-leaf mountain mahogany provides a major component of the habitat requirements for bighorn sheep within the SWHW. Approximately 47,000 acres of suitable habitat encompass the Highlands as well as the East Pioneer Mountains, northwest of Melrose. Approximately 8,300 acres of core habitat has been identified for bighorn sheep establishment in a joint effort between the MTFWP, Forest Service and Bureau of Land Management. The majority of the core habitat occurs on the Camp Creek allotment, primarily north of Camp Creek. Mountain Mahogany and sagebrush provide crucial winter habitat for bighorn sheep in the SWHW. Prior to a die-off in 1995, the population was around 400 individuals. Re-introduction efforts in the past 15 years have had mixed success and persistent lamb pneumonia appears to be hampering that effort. However, the current population trend and lamb recruitment is on the rise, and MTFWP proposes to re-open the HD in the near future. (Pers Com.Vanna Boccadorri, MTFWP 2013)

This is HD 340 for moose, deer and elk. Harvest data suggests that the moose population is healthy and on the rise. The elk population is on the high end for HD 340 and the trend has been slightly upward for the past 3 years. Mule deer populations appear stable but current trend data were not available. White-tailed deer damage complaints suggest that the population is thriving. Over the counter doe tags have helped to reduce the white-tailed deer population that has been expanding primarily along the Big Hole River.

Pronghorn population in HD 341 appears stable, but surveys from 2012 suggest a downward trend (Boccadorri 2013). Pronghorn forage primarily on sagebrush in the winter and sagebrush habitats in the SWHW are thriving.

The SWHW is in HD 341 for mountain goats, which is currently closed. There is still a remnant population of goats that congregate on the Forest Service northeast of the SWHW, off of BLM-administered lands. The habitat found on BLM lands in the SWHW is not typical of mountain goat habitat (Boccadorri 2013).

Black bears and mountain lions occupy a variety of habitats and are two of the primary large carnivores that inhabit the SWHW. Hunting seasons for both species are heavily regulated by MTFWP and when harvest quotas are met the seasons are closed.

Forest and Woodland Habitats

Forest and woodland habitats comprise approximately 10% of all ownerships, and approximately 11% of BLM-administered lands within the SWHW. Effective precipitation and aspect influences the establishment and composition of forests and woodlands.

Mahogany mortality, Soap Gulch, 2013.

Mountain mahogany woodlands are present on drier, rocky slopes and lower elevations in the watershed. Some slopes contain pure mahogany stands, while others are intermixed with Rocky Mountain juniper and Douglas-fir. Mountain mahogany is primarily found on well drained slopes with shallow, coarse rocky soils, most often associated with limestone in southwest Montana. Scattered limber pine trees are also found on these dry, limestone sites in the northern portion of the watershed, but are absent from the McCartney Mountain area in the southern part of the watershed. There is potential for conifers to overtop and outcompete the shade intolerant mahogany on slopes with high conifer density. Most mahogany stands are currently dominated by mid-development plants with few seedlings present. The IDT noted an abundant seed crop during the 2013 assessment, as well as some individual mahogany shrubs being affected by an unknown agent that is causing mortality.

The majority of forest types in the SWHW are single story, closed canopy stands consisting mainly of Douglas-fir trees 150 years or less in age. Lodgepole pine occurs, but is uncommon on BLM in the Southwest Highlands Watershed. Spruce, Rocky Mountain maple, and aspen are minor components, primarily in wetter areas. Limber pine is found in niche habitats in the northern portion of the watershed, but is absent from McCartney Mountain, possibly due to the geographic isolation of this area. Extensive, historic timber harvest for mining activities, followed by fire exclusion over the last 120 years, have led to increased conifer densities within stands. Some forested stands contain scattered "relic" Douglas-fir trees greater than 200 years old, surrounded by dense stands of younger Douglas-fir trees. Growth ring analysis of a sample of these older trees shows that diameter growth slowed at about the same time the young cohort

of Douglas-fir trees established in these stands. The increased density within stands has resulted in trees competing for limited nutrients and moisture, leading to reduced vigor and growth of individual trees. It has also led to a loss of Douglas-fir savannah structure (e.g. large, open grown trees) on the landscape. Also, as a result of fire exclusion, conifers have expanded into previously open meadows, aspen stands, and sagebrush/grasslands. Conifer density is extremely high in many of these expansion areas, and has resulted in "doghair" stands of Douglas-fir.

Closed canopy Douglas-fir stand. McCartney Mountain, 2013.


Douglas-fir defoliation by spruce budworm, Camp Creek allotment, 2013.

Western spruce budworm is a native defoliating insect which is present in the SWHW, and has caused heavy defoliation on many Douglas-fir trees in the assessment area. Western spruce budworm is favored by dry summer conditions and mild winters, and has the greatest impact on trees that are stressed from dense stocking, found in multi-storied stands, and/or are impacted by drought conditions (Kamps et al., 2008). Budworms grow more vigorously in stressed trees, and budworm populations can increase dramatically during drought conditions.

Prolonged budworm epidemics cause reduced diameter and height growth (Bulaon and Sturdevant, 2006). While spruce budworm does not usually cause direct tree mortality, it will predispose trees to attacks by other insects or diseases. The northern portion of the watershed (Camp Creek/Soap Gulch) has epidemic levels of spruce budworm, and topkill on Douglas-fir trees is common from repeated, heavy defoliation over the last approximately 10 years. Current budworm defoliation is low to moderate in the southern portion of the watershed (McCartney Mountain). However, the spruce budworm hazard rating is high throughout the watershed due to suitable stand conditions.

Douglas-fir beetle is a native bark beetle which kills Douglas-fir trees, preferring mostly large diameter trees growing in mixed or pure stands. Douglas-fir trees most susceptible to attack from Douglas-fir beetle are those larger than 14 inches diameter at breast height (DBH), older than 120 years, and growing in dense stands (Weatherby and Their, 1993). Douglas-fir beetle

normally kills small groups of trees, but at epidemic levels may kill groups of 100 trees or more (Schmitz and Gibson, 1996). Recent Douglas-fir beetle activity was noted in the Camp Creek allotment, and is causing mortality of the "relic" large Douglas-fir trees. The prescribed fire treatments in this area resulted in some scorched trees, which may have made these stands more attractive to Douglas-fir beetle by creating additional stresses. However, due to overstocked stand conditions, all Douglas-fir stands with trees greater than 14" DBH have high hazard ratings for Douglas-fir beetle.

Douglas-fir beetle mortality, Camp Creek allotment, 2013.

Fire Ecology and Fire Regimes within the Southwest Highland Watershed

As a prominent disturbance process in southwestern Montana, fire is directly tied to land health by affecting plant species composition, seral stage diversity, age classes, and landscape structures. Fire exclusion, caused primarily by removal of fine fuels by livestock grazing since the 1860's and fire suppression, has altered vegetative communities across the landscape. 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 to assessing land health, reference conditions, and functioning ecosystems.

Biophysical Settings

Biophysical Settings (BpS) are most simply defined as the native vegetation communities present in the pre-settlement 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 landscapes or 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 SWHW include several species of big sagebrush, Douglas-fir forest, and foothill-valley grasslands. Curl-leaf mountain mahogany makes up a small percentage of the watershed, but is of particular interest due to high value to wildlife. 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 (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 dominant BpS's in the watershed is presented in Table 10.

Table 10. Dominant Biophysical Settings across all ownerships within the Southwest Highlands Watershed.

Biophysical Setting Name (Number)	Total Acres by BpS in Watershed	% of Watershed
Inter-mountain basins big sagebrush steppe (1911250) and Shrubland (1910800)	65,393	54 %
Inter-mountain basins montane sagebrush steppe (1911260)	15,806	13 %
Middle Rocky Mountain Montane Douglas-fir Forest and Woodland (1911661), Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest-Douglas-fir (1910451), Northern Rocky Mountain Dry Forest Savanna (1910530)	15,021	13 %
Northern Rocky Mountain lower montane foothill-valley-grassland (1911390), Columbia Plateau Steppe and Grassland (1011230), Inter-mountain Basins Mixed Salt Desert Scrub (1910810)	7,364	6 %
Inter-mountain basins curl-leaf mahogany woodland and shrubland (1910620)	862	<1 %
Other, including Riparian Systems	15,660	13 %

Fire Regimes within the Southwest Highlands 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 group (Schmidt et al., 2002).

Table 11. Natural Fire Regime Groups within the Southwest Highlands Watershed.

Group	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.

Wyoming Big Sagebrush and Basin Big Sagebrush (BpS 1911250 & 1910800)

Fire Regime: Big sagebrush dominated vegetation communities are found in valley bottoms, swales and the toeslopes below about 7000 feet in elevation are characterized by Fire Regime Group III, 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 big sagebrush stratum is slightly to moderately departed from reference conditions and its historic fire regime. Most 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 overstory, but there are very few patches of post-disturbance early development sagebrush/grassland. Much of this plant community is important habitat for sage grouse.

Mountain Big Sagebrush (BpS 1911260)

Fire Regime: Mountain big sagebrush dominated communities are found above about 7,000 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 reported in the literature for this type 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. Mountain big sagebrush does not resprout following fire and recolonization 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 late-development mountain big sagebrush are greater than reference conditions, and the early to mid-development sagebrush component is lacking throughout the watershed. Douglas-fir and juniper are establishing in areas where conditions are suitable for conifers and are converting former sagebrush habitat into closed canopy, dense forest habitat.

During the 1980's and 1990's, several prescribed burns were implemented by the BLM in the mountain big sagebrush vegetation type within the SWHW. The objectives of these burns were two-fold: to reduce conifers expanding in to sagebrush/grassland, and to increase grass and forb production for cattle and wildlife. Between 2006 and 2011, the BLM also implemented

prescribed fire treatments in Soap Gulch, Camp Creek and on McCartney Mountain, specifically to reduce conifer expansion and to promote habitat diversity. Approximate acres burned during these projects are described in the Uplands Standard on Table 3, page 17.

Douglas-fir Forest (BpS 1911661, 1910451 & 1910530)
Fire Regime: The Douglas-fir forest in this watershed is best characterized by Fire Regime Group I. Fires were predominantly surface and mixed-severity, with a mean fire interval of 7-80 years. Occasional stand replacement fires may also occur. Much of the Douglas-fir forest is at the sagebrush-forest interface and was historically affected by fires in adjacent vegetation. Abundant evidence of past fires is present in 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 Douglas-fir forest savannah structure. Mixed-severity fires occurred primarily in denser stands, and at higher elevations. 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 BpS is considered uncharacteristic.

Current Conditions: The Douglas-fir forest stratum is moderately departed from reference conditions due to altered stand structure. Past timber harvesting followed by more than a century of fire exclusion has promoted an increase of dense, single age-class Douglas-fir forest. Herbaceous understory vegetation is sparse in many stands due to nearly complete canopy closure. Spruce budworm has severely defoliated or killed some densely stocked, young Douglas-fir stands, allowing sunlight to reach the ground and reestablishing grass and forb plant communities. Douglas-fir beetle is affecting many large diameter, relic Douglas-fir trees, further reducing the late development forest component. Many of the young, dense Douglas-fir stands (<100 year old) in this watershed have sagebrush skeletons on the ground, which indicates these sites were previously dominated by sagebrush.

Grasslands (BpS 1911390, 1011230 & 1910810)
Fire Regime: The foothill and valley bottom grasslands in this watershed are dominated by blue grama and needle-and-thread at lower elevations, and by bluebunch wheatgrass and Idaho fescue at higher elevations. This vegetation type has frequent replacement fires and is characterized by Fire Regime group II. Most species in this type are fire adapted and respond favorably to these fire types.

Where these systems occur within forested ecosystems, fire frequency will be strongly influenced by the surrounding forest's fire regime (e.g., 10-20yrs). Where these systems occur below lower treeline, fire frequencies may be longer (e.g., 20-30yrs). Drier sites with more bare ground will likely have a slightly higher mean fire interval. In large valleys, fires may have been expansive historically, up to thousands of acres.

Current Conditions: The grassland stratum is moderately to severely departed from reference condition due primarily to the lack of early seral plant communities. Late development grasslands also have higher than expected densities of shrubs due to long-term grazing and fire exclusion. On productive sites with deeper soil, conifers are encroaching into grasslands. The sagebrush expansion within this stratum does offer more suitable habitat for some sagebrush

obligate wildlife species. Non-native grass seedings also contribute to uncharacteristic grassland conditions.

Curl-leaf mountain mahogany (BpS 1910620)
Fire Regime: Curl-leaf mountain mahogany is found scattered throughout the SWHW, primarily on dry sites with shallow soil or on rock outcrops. Though mountain mahogany occupies a relatively small percentage of the landscape, it is of very high value to wildlife and a therefore an elevated management consideration.

Mountain mahogany does not resprout following fire, and is easily killed by fire. Curl-leaf mountain mahogany is a primary early successional colonizer rapidly invading bare mineral soils after disturbance. Fires are not common in early seral stages, when there is little fuel. Several fire regimes can affect this community type. It is clear that being very sensitive to fire and very long lived would suggest Fire Regime Group V and development in fire-safe sites (Gruell et al. 1985). This is true of late development classes, but younger classes can resemble more the surrounding sagebrush communities in their fire behavior and exhibit a Fire Regime Group IV. In this watershed, surface fires likely affected the adjacent vegetation relatively frequently, but often did not burn into mahogany stands due to the rocky terrain or bare soil in which it grows. At longer intervals, when sufficient fuels accumulated to carry fire, fires burning under dry, windy conditions likely killed entire mahogany stands. The resulting bare mineral seedbed provided the ideal conditions for a replacement stand.

Current Conditions: According to FRCC outputs, the mountain mahogany stratum is moderately departed from reference conditions due to the lack of mid to late-development plants within the community. However, the IDT found most mahogany communities to be dominated by mid-development plants with few young plants present. These observations suggest site potential may be limiting mahogany communities from advancing to late-development stages as described in LANDFIRE BpS model vegetation classes. In the foothills around Soap Gulch and Camp Creek, and on the west side of McCartney Mountain, conifers are beginning to shade-out some areas of mahogany. An unknown agent is also causing some individual plant mortality in these areas.

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 12. 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-

EuroAmerican 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 12. Summary of Fire Regime Condition Classes across all ownerships within the Southwest Highland Watershed.

Biophysical Setting	Fire Regime Group (I-V)	Condition Class 1 (ac)	Condition Class 2 (ac)	Condition Class 3 (ac)	Total Acres
Intermountain basins big sagebrush steppe (Wyoming big sagebrush)	III	18 %	69 %	13 %	65,393
Intermountain basins montane sagebrush steppe (mountain big sagebrush)	I	7 %	90 %	2 %	15,806
Northern Rocky Mountain lower montane foothill-valley-grassland (grassland/scrub)	II	19 %	3 %	78 %	7,364
Northern Rocky Mountain dry-mesic montane mixed conifer forest- Douglas-fir; Dry Forest Savanna	I	12 %	72 %	16 %	15,021
Intermountain basins curl-leaf mountain mahogany	III	19 %	0 %	81 %	862
Other BpS acres not included in FRCC assessment					15,660
Total Acres		16,404	70,372	17,670	120,106
% of Watershed		14 %	59 %	15 %	

Fire Regime Condition Class Summary

The FRCC table above shows that, considering only the dominant non-riparian BpS's, approximately three-fourths of the SWHW is in Condition Class 2 or 3, which corresponds to a moderate-to high departure from pre-EuroAmerican settlement conditions. Fire exclusion has caused some big sagebrush communities to stall in mid to late-development succession classes, with little representation of an early seral class. Conifer expansion into big sagebrush communities also contributes to the departure. Also due to fire exclusion and extensive timber harvesting during the mining era, many forest communities are overstocked with small diameter, single age class trees typical of early development vegetation classes. Where a mature timber overstory exists, smaller size-class trees growing beneath the canopy are contributing to departure from reference conditions.

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 there are only two of major concern in the SWHW, they are

spotted knapweed and leafy spurge. Canada thistle, another state declared noxious weed also found in the SWHW, is widespread throughout the Dillon Field Office mostly in riparian areas making treatment difficult.

Spotted knapweed (*Centaurea stoebe*), a biennial or short lived perennial, whose early spring growth allows it to outcompete other plants for moisture and nutrients and whose ability to produce a chemical that prevents other plants from growing in the immediate area, is found scattered throughout the SWHW. Most infestations are found along roads and trails but a few are found along other disturbances such as drainages and washes. The infestations are more numerous and dense in the areas of highest recreational use. Due to its location, the potential is high for knapweed to be spread by vehicles, livestock, wildlife, recreation and other activities.

Leafy spurge (*Euphorbia esula*), a deep rooted perennial, is toxic to most animals, except sheep, and its milky latex like sap may cause severe skin rashes in humans. Once established in an area leafy spurge has been found to be tough to control. Persistent, long-term treatment with herbicides is effective and research shows that targeted grazing, using sheep, will reduce spurge vigor and competitive advantage giving native grasses and forbs a chance to compete. Numerous releases of leafy spurge flea beetles (*Aphthona lacertosa* and *nigriscutis*) and stem boring beetles (*Oberea erythrocephala*), which may provide long term control, have been distributed in the area. The leafy spurge is primarily located in the southeast portion of the watershed.

Other noxious or invasive weeds present primarily as small patches and/or widely scattered infestations in the watershed include cheatgrass, houndstongue, common mullein, black henbane, and Dalmatian toadflax. Cheatgrass is found in small patches throughout the watershed, primarily on south and west facing slopes where there has been some past disturbance. Black henbane and common mullein are found primarily around ground disturbance and along roads. Houndstongue is common in disturbed riparian bottoms. The only known infestation of Dalmatian toadflax is in the upper Soap Gulch drainage near the Forest Service boundary.

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 contain, control or eradicate existing infestations in the SWHW using Integrated Pest Management (IPM). Weed control efforts in the SWHW area have been limited throughout the years, mainly due to many parts the area being inaccessible and limited funding. Table 13 shows the herbicide treatments applied in the SWHW during the past five years.

Table 13. Recent weed inventories and treatments within the Southwest Highlands Watershed.

Year	Acres Treated	Acres Inventoried
2008	25	2100
2009	40	3300
2010	50	4000
2011	30	2600
2012	150	8000

Findings and Analysis

Special Status Species

Sage grouse populations and sagebrush habitats have declined on a regional basis due to significant habitat losses range-wide from habitat conversion for agricultural needs, urbanization, energy development, livestock grazing, and wildland fire. Currently the largest threat to sage grouse in the Western United States is the loss of sagebrush habitat and fragmentation. There is one active lek in the SWHW that has moved over the years but the counts remain similar. There is one historic lek outside the watershed the approximately 1 mile north of Soap Gulch that has not had documented activity in the last 20 years, although sage grouse have been documented in the area in the spring.

Sagebrush habitat plots completed in 2012 and 2013 in the SWHW and adjacent Rochester Basin averaged 17.5% canopy cover (cc) of shrubs (primarily sagebrush and some rabbit brush) with an average height of 18", a 14.7% cc of grasses with a stubble height of 8" and 4% forb component. The forb component is on the low end due to the fact that these plots are taken in sagebrush habitats associated with nesting. In general many forbs are early seral species or require more moisture, therefore higher forb production occurs on disturbed sites and in riparian habitast that are used during brood rearing. This data suggests that sage grouse needs for the two crucial time periods of nesting and winter are being met based on WAFWA guidelines.

Since delisting in 2011, a hunting season for wolves has been administered by MTFWP. The SWHW lies within wolf management unit (WMU) 320. Wolf sightings are reported in the Highlands yearly, but the Table Mountain pack no longer exists in the northeast portion of the SWHW (Bradley et al. 2013.) Conflicts between wolves and livestock will continue to be an issue into the future.

Bat habitat associated with abandon mine lands (AML) is surveyed and analyzed on a case –by – case basis and separate NEPA is completed to determine the type of closure required to provide for human safety. In the past 12 years many features in the SWHW have been closed by placing grates with bat copulas to allow for continued bat usage. Sites that were determined to have no or little value to bats or were unstable to remain open have been permanently closed.

Generalist or Widespread Species

The moose, elk, deer and antelope populations in these HD's are resident and do not migrate, nor do any of the wintering big game populations from neighboring HD's migrate into the SWHW. Many of the elk and deer herds do move throughout the SWHW and congregate on specific winter range. Overall, upland conditions were met throughout the SWHW, providing adequate habitat for big game and other generalist species. The winter range for pronghorn, mule deer, elk and moose in the SWHW is in good condition and much of it is in areas that see little to no grazing by permitted livestock. Much of the mountain mahogany shows signs of heavy winter browsing by big game.

Bighorn sheep habitat was found to be in good condition and similarly much of the habitat receives little to no use by livestock due to the terrain. The exception is the mahogany habitat that seems to be decadent and has little to no regeneration. As noted above where regeneration is

present it is heavily hedged by wintering big game. Conifers are beginning to shade-out some areas of mahogany in the foothills around Soap Gulch and Camp Creek and some plant mortality was also noted in in these areas.

Some fences were found to be a hindrance to wildlife movements and can cause mortality. Sage grouse and raptors may fly into them and big game can become entangled. These are primarily old sheep fences constructed of page or net wire, or barbwire fences with more than 4 wires with a very low bottom wire and high top wire. Many of these have been modified or removed in the past, but some still remain.

Riparian and Aquatic Species

Riparian habitat and stream conditions are discussed, previously under Western Montana Standard #2. All wildlife species use riparian habitat during some part of their lifecycle. Fishery habitat conditions range from poor to good on the BLM portions of the drainage. Many of the same issues identified in the 2003 assessment were also noted in 2013. Stream reaches with over-widened stream channels, as well as, sediment transport issues were still found to be a concern. Conditions do appear to be improving, albeit very slowly.

During 2013, water temperature data were collected along Camp Creek reach 551. These data show that this portion of the drainage was close to the upper threshold for cold-water species. Many of the elevated temperatures experienced in 2013 can likely be attributed to climatic factors. Throughout the Dillon Field Office, all streams monitored in 2013 experienced increased summer averages, peak temperatures as well as extended periods of high water temperatures. In addition to the climatic influence, the topography and geology of the Camp Creek drainage likely has a strong influence on water temperatures. The condition of the riparian area is also likely contributing to increased water temperatures due to decreased overhead riparian cover resulting in increased exposure of the stream to the sun.

The Partners in Flight Bird Conservation Plan for Montana was prepared "to focus on restoring healthy ecosystems that will sustain productive and complete bird communities" (Montana Partners in Flight, 2000), and identified 107 species for priority status in five habitat groups. Most of these birds 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 be present yearlong depending on seasonal conditions. The USFWS has also identified a list of 22 "Birds of Conservation Concern" for the Rocky Mountain Region, (USDI 2008). Many of these species use riparian habitat for all or part of their lifecycle. According to the Natural Heritage Tracker website (MTNHP 2013), 12 have occurrence records within the SWHW (Table 14).

Table 14. USFWS Birds of Conservation Concern.

Bald eagle	Olive-sided flycatcher
Brewer's sparrow	Peregrine falcon
Ferruginous hawk	Sage thrasher
Loggerhead shrike	Swainson's hawk
Long-billed curlew	Williamson's sapsucker
McCown's longspur	Willow flycatcher

Forest and Woodland Management
Current forest stand conditions will likely continue to support epidemic insect and disease activity. Complete Douglas-fir canopy defoliation caused by spruce budworm may encourage the reestablishment of former sagebrush/grassland openings within forested habitat. Partial defoliation causing top-kill will permanently stunt tree growth and likely result in deformed, bushy trees. Commercial salvage opportunities to harvest merchantable dead and/or dying timber in the SWHW are limited by the low value of potential products, steep rocky terrain, and the lack of usable existing roads. In much of the SWHW, non-commercial mechanical treatment to improve forest health and/or to remove conifers is cost prohibitive due to size and density of existing trees. Using prescribed fire to mitigate smaller size-class conifer expansion in appropriate areas is listed as a recommendation below.

Mountain mahogany stands will continue to be negatively affected by conifer competition and other agents. The costs associated with treatments to retain existing mahogany stands, or to promote mahogany regeneration, would likely not be worth the small potential increase in total mahogany cover or stand health.

Recommendations
Recommendations included above, under Upland and Riparian Health, are also expected to improve habitat conditions in the specified areas.

Wildlife

1. 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.

2. 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.

3. Continue to maintain wildlife escape ramps in all stock tanks in the watershed.

4. 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.

Noxious Weeds and Invasive Species

1. Continue to work cooperatively with Madison County and other agencies, landowners and partners to manage noxious weeds within the SWHW.

2. Due to the size and density of the leafy spurge infestations, focus control toward containing it within the areas already infested by using biological control, to reduce density and vigor of large infestations. Herbicide treatments will be focused on areas most likely to contribute to spread (i.e. roads, trails and washes).

3. Actively encourage private landowner participation to help control weed spread. Communicate and cooperate with private landowners to gain access across their land to treat or inventory weed infestations.

4. Consider using fire followed by herbicide treatments on test plots of leafy spurge to determine the effectiveness of this form of treatment

Conifer Expansion

1. Consider using prescribed fire, mechanical treatment, and other means to mitigate conifer expansion into existing mountain big sagebrush communities.

Additional Issues and/or Concerns

Travel Management

Motorized vehicles were limited to designated routes only in the Dillon Field Office's 2006 RMP. Any mapping errors or other issues identified, regarding these route designations, will be addressed in the environmental assessment.

Recommendation

1. Un-designate the open route in Timber Canyon where there is no public access across private lands.
2. Designate the route up Buhrer Gulch as open to wheeled motorized vehicles yearlong. Although this route is a short spur route, it would provide public recreational access to a historic grave site and spring development along a well-established, constructed route. (photos below)

3. Correct a mapping error west of Muller Spring to show the better of two routes as open to motorized vehicles, and close the one currently shown as open.

Abandoned Mine Lands

In the late 1980's and early 1990's, the State of Montana grated numerous shafts throughout southwest Montana, including a number of shafts in the Rochester area. Never-the-less, numerous features still exist. The BLM has been inventorying and developing a closure plan for

the remaining dangerous features in the Rochester area. The BLM has recently closed features at the Eclipse and Emma mines, both located near Rochester and both within the SWHW. Bat-friendly grates were installed on some of the grates at Emma.

Recommendation

1. Continue inventorying and addressing legacy mining issues within the SWHW through the AML program.

Interdisciplinary Team Composition

Core IDT members for the SWHW Assessment include:

Brian Thrift, Rangeland Management Specialist (IDT Leader)
Kelly Bockting, Wildlife Biologist
Paul Hutchinson, Fisheries Biologist
Aly Piwowar, Forester
Kipper Blotkamp, Forester / Fire Ecologist
Stephen Armiger, Hydrologist (Soil, Water & Air)
Rick Waldrup, Outdoor Recreation Planner
Erik Broeder, Butte Field Office Rangeland Management Specialist (Riparian Coordinator)
Pat Fosse, Supervisory Natural Resource Specialist

Support IDT members include:

Michael Mooney, Weeds Specialist
Jason Strahl, Archaeologist
Laurie Blinn, GIS Specialist
Emily Guiberson, Forester
Katie Benzel, Wildlife Biologist
Kelly Savage, Rangeland Management Specialist (Special Status Plants)
Bob Gunderson, Geologist
Dave Williams, Butte Field Office Geologist (Abandoned Mine Lands)
Greg Campbell, Butte Field Office Fuels Management Specialist

Other specialists involved:

Weston Miller, Forestry Technician
Aaron Brashear, Biological Technician
Tempe Regan, Biological Technician
Bryce Nelson, Range Technician
Leea Anderson, Range Technician
Berett Erb, Range Technician
Joe Dunn, Range Technician
Shelby Barnes, Range Technician
Jed Berry, Fisheries Technician

Other agency staff involved or consulted:

Vanna Boccadori, Wildlife Biologist, Montana Department of Fish, Wildlife and Parks

Glossary of Terms

Anthropogenic: Caused or influenced by humans.

Bankfull stage: "The bankfull stage corresponds to the discharge at which channel maintenance is most effective, that is, the discharge at which moving sediment, forming or removing bars, forming or changing bends and meanders, and generally doing the work that results in the average morphologic characteristics of channels." Dunne and Leopold (1978).

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.

Channel stability: the ability of the stream, over time, to transport the flows and sediment of its watershed in such a manner that the dimension, pattern and profile of the river is maintained without either aggrading nor degrading.

Entrenchment: the vertical containment of river and the degree to which it is incised in the valley floor.

Entrenchment ratio: a quantitative expression of the ratio of the floodprone width to the bankfull width.

Floodprone width: width measured at an elevation which is determined at twice the bankfull depth.

Forest land: land that is now, or has 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).

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

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: Any plant growing in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content.

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.

Lacustrine: from the French "lacustre" or lake. Permanently flooded lakes and reservoirs, generally over 20 acres, exhibiting wave-formed or bedrock shoreline features (Cowardin et al., 1979).

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.

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

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

Palustrine: from the Latin "palus" or marsh. All non-tidal wetlands dominated by trees, shrubs, persistent emergent plants, emergent mosses or lichens (Cowardin et al., 1979)

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 waterflow, thereby 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: the small depressions and areas of compaction in saturated soils caused by the hoof action of animals.

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.

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.

Spring province: a group of springs in close geographical proximity.

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.

Wilderness Characteristics: These attributes include the area's size, it's 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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