

Lower Little Beaver Watershed Ten Year Monitoring and Standards and Guidelines Report

Glasgow Field Office
2011



Executive Summary

This document is a report on the current status of the Standards for Rangeland Health in the Lower Little Beaver Watershed in south Valley County, Montana. The document also addresses other resources such as Cultural, Transportation, Recreation, Visual Resource Management (VRM) and Weeds.

Below is the summary table depicting the current Rangeland Health Standard determination in the Lower Little Beaver Watershed made in 2011 along with recommendations for each grazing allotment.

Allotment # & Name	Are Healthy Rangelands Standards Being Met?				Is livestock grazing a significant factor in allotment not meeting standards?	Narrative Explanation and Recommended Actions
	Upland	Riparian/ Wetland	Water quality	Wildlife/ Bio-diversity		
4551 Upper Brazil	Yes	Yes	Yes	Yes	N/A	Maintain current grazing system.
4552 Upper Little Beaver	Yes	No*	Yes	Yes	No	Maintain current grazing system. Allotment contains part of the Mountain Plover ACEC.
4567	Yes	Yes	Yes	Yes	N/A	No changes recommended.
4573 Little Beaver	Yes	Yes	Yes	Yes	N/A	Maintain current grazing system.
4574 Miller Coulee	Yes	Yes	Yes	Yes	No	Allotment has been converted to a deferred rotation grazing system and a water pipeline has been installed. Pasture fence was moved.
4575 Gideon Place	Yes	Yes	Yes	Yes	N/A	No changes recommended.
4576 Lower Willow	Yes	Yes	Yes	Yes	N/A	Maintain current system. Existing well is being utilized.
4577 Mud Creek	Yes	No*	Yes	Yes	No	Maintain existing system. Exclosure built on Willow Ck.
4583 Lower Little Beaver	Yes	No*	Yes	Yes	No	No changes recommended at this time.
4584 Archambeault Place	Yes	NA	Yes	Yes	N/A	No changes recommended.
4585 Lewis Reservoir	Yes	Yes	Yes	Yes	N/A	No changes recommended.
4586 Upper Mud	Yes	NA	Yes	Yes	N/A	No changes recommended.
4587 Duck Creek	Yes	NA	Yes	Yes	N/A	No changes recommended.
4592 Bomber Coulee	Yes	NA	Yes	Yes	N/A	No changes recommended.

* Three of the allotments in this watershed, #4552 Upper Little Beaver, #4577 Mud Creek, and #4583 Lower Little Beaver, are not currently meeting the Riparian Standard. The reason these allotments are not meeting the Riparian Standard is that the physical and chemical properties of the soil in these stream reaches are limiting factors in their potential and are not due to livestock grazing.

Water quality information is available in Montana's 2008 Integrated Water Quality Report. The Department of Environmental Quality (DEQ) is the lead agency for determining beneficial use support and achievement of water quality standards.

The issue of scale must be kept in mind in evaluating each standard. It is recognized that isolated sites within a landscape may not be meeting the standards; however, broader areas must be in proper functioning condition. No single indicator provides sufficient information to determine rangeland health. They are used in combination to provide information necessary to determine rangeland health.

Before any changes or improvements are made in these allotments further environmental analysis will be completed. Changes or improvements are contingent upon staffing to complete the analysis and adequate construction funding.

Based on my review of the Interdisciplinary Team's recommendation and other relevant data and information, I have determined that the allotments in the Lower Little Beaver Watershed meet the Standards for Rangeland except as noted above in the Executive Summary table.

Authorized Officer Determination:

Authorized Officer: _____
Phoebe J. Patterson

Date: _____

Title: _____ Glasgow Field Manager

Introduction

The Lower Little Beaver Watershed is comprised of 124,154 acres of BLM – administered public lands as well as 9,838 acres of private and state lands in south Valley County, Montana. Land ownership is approximately 92% public administered by the BLM. The watershed is comprised of 14 livestock grazing allotments with thirteen permittees holding the 10-year term permits. There are currently seven allotment management plans covering this watershed.

The watershed level management program currently being used in the Glasgow Field Office is a result of decisions made in the Judith-Valley-Phillips Resource Management Plan (JVP-RMP) dated September 1994. Initial assessments of the riparian and upland areas of the Lower Little Beaver (LLB) Watershed were conducted during the grazing season of 2000. The LLB Watershed Plan was completed in March of 2001. The Lower Little Beaver Watershed Monitoring and Standards and Guidelines 5 Year Report was completed in 2006.

Temperature and Precipitation

The following tables show the average of the temperature and precipitation from two weather stations since 1997 and the deviation from that average in the 2008-2009 year.

Ft. Peck Station

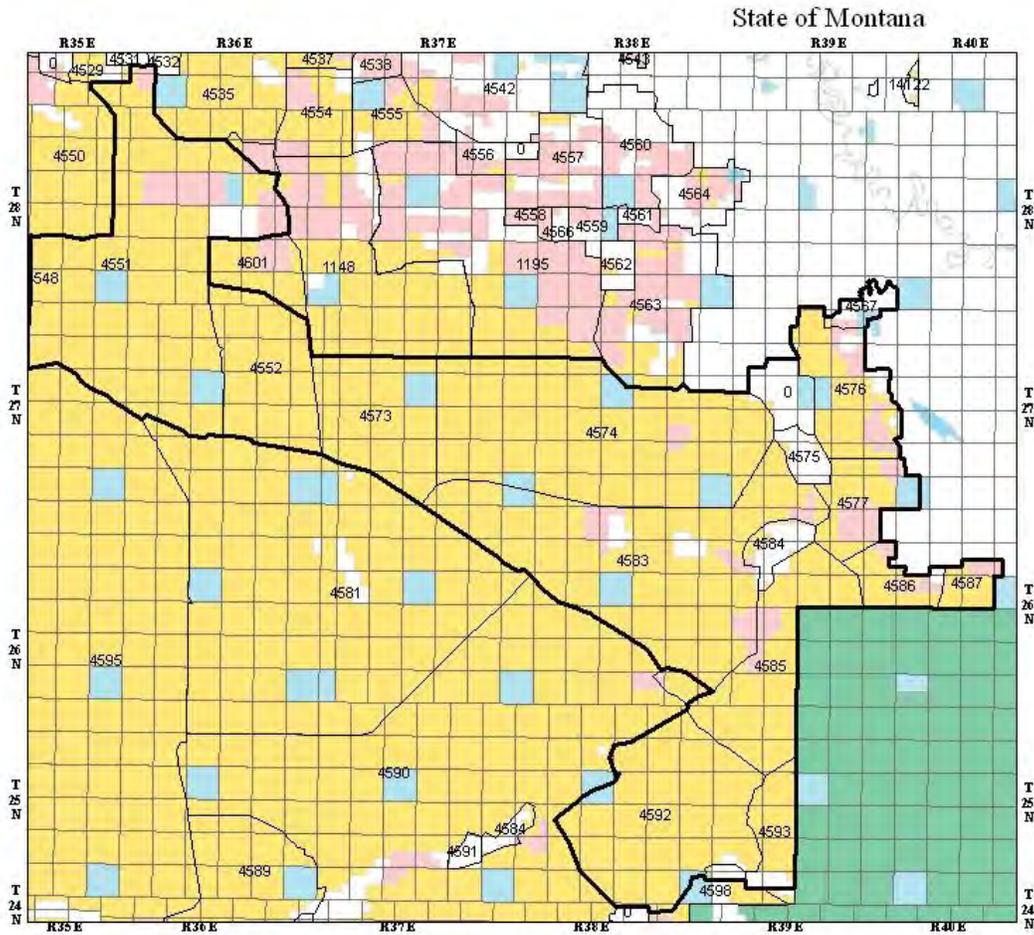
Fort Peck Cooperative Site			
	1997-2009	2008-2009	Deviation
Annual Precipitation (In.)	11.5	9.0	-2.3
Avg. Max. Temp. (F)	57.0	59.9	2.9
Avg. Min. Temp. (F)	32.7	32.5	-0.2
Avg. Avg. Temp. (F)	44.8	46.2	1.4

Glasgow Station

Glasgow Station			
	1997-2009	2008-2009	Deviation
Annual Precipitation (In.)	11.9	12.9	1.0
Avg. Max. Temp. (F)	55.0	54	-1.0
Avg. Min. Temp. (F)	29.3	28.9	-0.4
Avg. Avg. Temp. (F)	42.1	41.5	-0.6

More recent data to update the long term average is not available at this time. The Weather Service office in Glasgow reported that as of the end of March 2011 there was a total of 105.3 inches of snowfall which was 78.3 inches above the long term average. The total snowfall, including what was received in April, totaled 108 inches which was an all time record for Glasgow. This snowfall resulted in significant and wide spread flooding in the spring of 2011. According to the National Weather Service the months of November through March were both colder and snowier than normal.

Figure 1



Lower Little Beaver Watershed Boundary

Legend

Watershed Boundary	BLM - Land Utilization	Private
Allotment Boundaries	BLM - Public Domain	State
Section	US Fish & Wildlife Service	WATER



United States Department of the Interior
Bureau of Land Management
Montana/Dakotas State Office
Map created on Jan 20, 2012



CAUTION:
Land ownership data is derived from less accurate data than the 1:25,000 scale base map. Therefore, land ownership may not be shown for parcels smaller than 40 acres, and land ownership lines may have plotting errors due to source data.

No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by the BLM.

History

When the Little Beaver Watershed Plan was completed it was determined during the evaluation phase that the uplands were meeting or exceeding the JVP-RMP requirement that 80% or more of the watershed was in good or excellent condition. In fact, 84% of the lands were meeting the standard.

Below is the table showing the initial standard determination made in the Little Beaver Watershed Plan in 2001.

Table 1

Allotment # & Name	Are Healthy Rangelands Standards Being Met?				Is livestock grazing a significant factor in allotment not meeting standards?	Narrative Explanation and Recommended Actions
	Upland	Riparian/ Wetland	Water quality	Wildlife/ Bio-diversity		
4551 Upper Brazil	Yes	Yes	Yes	Yes	N/A	Maintain current grazing system. Repair VR-2 pipes. Test water quality on VR-2.
4552 Upper Little Beaver	Yes	No	Yes	Yes	No	Maintain current grazing system. Allotment contains part of the Mountain Plover ACEC.
4567	Yes	Yes	Yes	Yes	N/A	No changes recommended.
4573 Little Beaver	Yes	No	Yes	Yes	No	Maintain current grazing system. New fences and grazing system installed 2 seasons ago. Address crossing problem. Repair
4574 Miller Coulee	No	No	Yes	Yes	Yes	Convert to deferred rotation system to decrease utilization levels. Build water pipeline to aid livestock distribution in Miller Coulee. All riparian meeting standards except Miller Coulee.
4575 Gideon Place	Yes	Yes	Yes	Yes	N/A	No changes recommended.
4576 Lower Willow	Yes	Yes	Yes	Yes	N/A	Maintain current system. Utilize the existing well.
4577 Mud Creek	Yes	No	Yes	Yes	No	Maintain existing system. Build enclosure on Willow Creek. Monitor
4583 Lower Little Beaver	Yes	No	Yes	Yes	No	Lower water level and allow trickle through Grub reservoir. Test water in Little Beaver Creek for metals. So soil chem.. comparison between Little Beaver and Lonetree creeks. Build enclosure on Little Beaver Creek. Monitor.
4584 Archambeault Place	Yes	NA	Yes	Yes	N/A	No changes recommended.

Allotment # & Name	Are Healthy Rangelands Standards Being Met?				Is livestock grazing a significant factor in allotment not meeting standards?	Narrative Explanation and Recommended Actions
	Upland	Riparian/ Wetland	Water quality	Wildlife/ Bio-diversity		
4585 Lewis Reservoir	Yes	Yes	Yes	Yes	N/A	No changes recommended.
4586 Upper Mud	Yes	NA	Yes	Yes	N/A	No changes recommended.
4587 Duck Creek	Yes	NA	Yes	Yes	N/A	No changes recommended.
4592 Bomber Coulee	Yes	NA	Yes	Yes	N/A	No changes recommended.

In a joint effort to increase monitoring efficiency and raise permittee awareness the Glasgow Field Station collaborated with Dr. John Lacy to implement a monitoring program for the permittees in this watershed and the Badlands Cooperative State Grazing District. To date, all of the permittees in this watershed are participating in the monitoring program.

Table 2

Below is the table depicting the standard determination in the Little Beaver Watershed made in 2005.

Allotment # & Name	Are Healthy Rangelands Standards Being Met?				Is livestock grazing a significant factor in allotment not meeting standards?	Narrative Explanation and Recommended Actions
	Upland	Riparian/ Wetland	Water quality	Wildlife/ Bio-diversity		
4551 Upper Brazil	Yes	Yes	Yes	Yes	N/A	Maintain current grazing system. VR-2 has been repaired.
4552 Upper Little Beaver	Yes	No	Yes	Yes	No	Maintain current grazing system. Allotment contains part of the Mountain Plover ACEC.
4567	Yes	Yes	Yes	Yes	N/A	No changes recommended.
4573 Little Beaver	Yes	Yes	Yes	Yes	N/A	Maintain current grazing system. New fences and grazing system installed 2 seasons ago.
4574 Miller Coulee	Yes	No	Yes	Yes	Yes	Allotment has been converted to a deferred rotation grazing system and a water pipeline has been installed. * See recommendation note below.
4575 Gideon Place	Yes	Yes	Yes	Yes	N/A	No changes recommended.
4576 Lower Willow	Yes	Yes	Yes	Yes	N/A	Maintain current system. Existing well is being utilized.
4577 Mud Creek	Yes	No	Yes	Yes	No	Maintain existing system. Exclosure built on Willow Ck.
4583 Lower Little Beaver	Yes	No	Yes	Yes	No	Headgate boards in Grub Res. Replaced with a trickle hole. Exclosure built on

Allotment # & Name	Are Healthy Rangelands Standards Being Met?				Is livestock grazing a significant factor in allotment not meeting standards?	Narrative Explanation and Recommended Actions
	Upland	Riparian/Wetland	Water quality	Wildlife/ Bio-diversity		
						Little Beaver Ck.
4584 Archambeault Place	Yes	NA	Yes	Yes	N/A	No changes recommended.
4585 Lewis Reservoir	Yes	Yes	Yes	Yes	N/A	No changes recommended.
4586 Upper Mud	Yes	NA	Yes	Yes	N/A	No changes recommended.
4587 Duck Creek	Yes	NA	Yes	Yes	N/A	No changes recommended.
4592 Bomber Coulee	Yes	NA	Yes	Yes	N/A	No changes recommended.

* In order to address riparian concerns the pasture fence between pastures 1 and 2 along Sagehen Creek will be moved to the ridge on the west side of Sagehen Creek and the water pipeline will be extended to the south to accommodate two more water tanks in pasture 2 and also extended to the east to provide one more tank in pasture one to facilitate better livestock distribution. These projects are proposed for fiscal year 2007 but are subject to the availability of funds.

An N/A in one of the columns addressing whether or not Healthy Rangeland Standards are being met indicates that the allotment either does not contain manageable reaches or quantities of the indicated resource or the allotment was not assessed for that particular standard.

An N/A in the column addressing whether or not livestock grazing was a significant factor in an allotment not meeting standards indicates that the allotment was meeting the standards that applied to that allotment.

Range Improvements

Since 2001 there have been two pipelines completed. The first was the Miller Coulee pipeline in the Miller Coulee allotment #4574. The second was Tom Tom pipeline that is shared between several allotments including Skunk Coulee #4593, Bomber Coulee # 4592 and Lewis Reservoir # 4585. In addition there were seven water developments (pits and reservoirs) that were constructed in various allotments within the watershed. There were three major road improvement/safety projects that involved detention reservoirs. One, Arrambide Reservoir, is in the MLT watershed but the other two, Grub and Deepcut Reservoirs, are in the Little Beaver watershed. The roads over these structures were reconstructed after replacing the drawdown pipes through them. Grub also had a major rip rap project completed on the face of the embankment as the face was being washed away by wave action threatening the safety and integrity of the road.

Finally, there were two exclosures built in this watershed in compliance with the recommendations of the original watershed document. One is on Willow Creek and the other is on Little Beaver Creek.

January Reservoir on the Beaver Branch road is scheduled to have the pipe replaced in Fiscal year 2014.

Current Status

When the monitoring program was instituted, Dr. Lacey contracted with the Grazing District and the permittees to help them establish a monitoring program with the intention of training the permittees to continue monitoring on their own. The program has been very successful and is a significant factor in the progress that has been made in this watershed.

The BLM's monitoring policy states that sites not meeting standards would be monitored every year. Sites that are meeting standards would be monitored every five years. The monitoring policy for all seven watersheds within the Glasgow Field Office's area of responsibility will be that, at a minimum, all sites not meeting standards will continue to be monitored yearly while sites that are meeting standards will continue to be monitored every five years. This policy will apply to BLM personnel as well as the permittees. All sites can be monitored more frequently if desired or needed by the BLM or the permittees.

Current standard determinations were made in the Lower Little Beaver Watershed during the 2011 field season (Table 3). The DEQ is responsible for water quality monitoring while it is up to the BLM to monitor water quality restoration actions to establish the effectiveness of water quality improvement and land health restoration treatments. As the table illustrates, all of the allotments in this watershed are meeting the Standards for Rangeland Health or if not meeting a Standard it is not livestock caused.

Table 3

Allotment # & Name	Are Healthy Rangelands Standards Being Met?				Is livestock grazing a significant factor in allotment not meeting standards?	Narrative Explanation and Recommended Actions
	Upland	Riparian/Wetland	Water quality	Wildlife/ Bio-diversity		
4551 Upper Brazil	Yes	Yes	Yes	Yes	N/A	Maintain current grazing system.
4552 Upper Little Beaver	Yes	No*	Yes	Yes	No	Maintain current grazing system. Allotment contains part of the Mountain Plover ACEC.
4567	Yes	Yes	Yes	Yes	N/A	No changes recommended.
4573 Little Beaver	Yes	Yes	Yes	Yes	N/A	Maintain current grazing system.
4574 Miller Coulee	Yes	Yes	Yes	Yes	No	Allotment has been converted to a deferred rotation grazing system and a water pipeline has been installed. Pasture fence was moved.
4575 Gideon Place	Yes	Yes	Yes	Yes	N/A	No changes recommended.

Allotment # & Name	Are Healthy Rangelands Standards Being Met?				Is livestock grazing a significant factor in allotment not meeting standards?	Narrative Explanation and Recommended Actions
	Upland	Riparian/ Wetland	Water quality	Wildlife/ Bio-diversity		
4576 Lower Willow	Yes	Yes	Yes	Yes	N/A	Maintain current system. Existing well is being utilized.
4577 Mud Creek	Yes	No*	Yes	Yes	No	Maintain existing system. Exclosure built on Willow Ck.
4583 Lower Little Beaver	Yes	No*	Yes	Yes	No	No changes recommended at this time.
4584 Archambeault Place	Yes	NA	Yes	Yes	N/A	No changes recommended.
4585 Lewis Reservoir	Yes	Yes	Yes	Yes	N/A	No changes recommended.
4586 Upper Mud	Yes	NA	Yes	Yes	N/A	No changes recommended.
4587 Duck Creek	Yes	NA	Yes	Yes	N/A	No changes recommended.
4592 Bomber Coulee	Yes	NA	Yes	Yes	N/A	No changes recommended.

* Allotments not meeting Standard due to physical and chemical properties of the soil and not livestock grazing.

Uplands

All of the allotments in the Lower Little Beaver Watershed were assessed for upland standards in 2011 by an interdisciplinary team using the BLM approved method: The 17 Indicators of Rangeland Health. All of the rangelands were determined to be healthy and meeting the Upland Standard of the Standards for Rangeland Health. The following table shows all of the assessments that were completed and the allotments where the assessments took place. See Appendix 1 for Upland Photos.

Table 4

Allotment Name and Number	Site Number	Upland Health Rating	Upland Standard Determination	Comments
#4551 Upper Brazil	W-2	PFC	Met	
	S-2	PFC	Met	
	M-1	PFC	Met	
#4552 Upper Little Beaver	N-1	PFC	Met	
#4567		PFC	Met	Category C, No Study Plot, ID Team Determined Rating
#4573 Little Beaver	S-1	PFC	Met	
#4574 Miller	J-1	PFC	Met	

Coulee	S-1 MC-1 MC-2 T-2	N/A PFC PFC PFC	N/A Met Met Met	Photo Point
#4575 Gideon Place		PFC	Met	Category C, No Study Plot, ID Team Determined Rating
#4576 Lower Willow	A-1	PFC	Met	
#4577 Mud Creek	A-1 M-2	PFC N/A	Met N/A	Abandoned
#4583 Lower Little Beaver	G-1 G-2 DC-2	PFC N/A PFC	Met N/A Met	Abandoned
#4584 Archambeault Place		PFC	Met	Category C, No Study Plot, ID Team Determined Rating
#4585 Lewis Reservoir	B-1	PFC	Met	
#4586 Upper Mud	M-1	PFC	Met	
#4587 Duck Creek		PFC	Met	Category M, No Study Plot, ID Team Determined Standard Met
#4592 Bomber Coulee	R-2	PFC	Met	

Site numbers are numbered by which pasture they are located in. The sites that were determined to not be representative of an ecological site by the ID Team were moved or abandoned if sufficient study sites were already located within an allotment.

Soils

Soils within the watershed developed in residuum from sedimentary shales (64%) of the Bearpaw Formation, slope and recent alluvium (25%), and glacial till (11%). Soils developed in a climate with long, cold winters; moist springs; and, warm to hot summers. Soil patterns are complex; and, physical and chemical properties and productivity can vary within short distances (less than 25 feet). Soluble salts and sodium are present in most soils of the area. Soils are strongly saline and sodic on the alluvial fans and terrace treads adjacent to the drainages. Vegetation composition and production are affected by the high concentrations of these salts and sodium.

Most of the hills are comprised of clayey soils weathered from clayey or acid shale. These sedimentary soils are considered “fragile” because of extreme physical properties such as high clay content, slow permeability, very high surface runoff, relatively shallow to moderate depth (less than 40 inches) to bedrock, and sparse vegetative ground cover. Active geologic erosion is observed on these landforms. Erosion can be accelerated by surface disturbance, especially on the steep slopes when the protective vegetative cover is removed. Predominant soils include the Lisam, Dilts, and Thebo series. Associated ecological sites include: Shallow clay, Coarse clay, and Clayey, 10 to 14 inch precipitation (Ppt.) zone, sedimentary plains, east.

Soils that developed from slope alluvium on alluvial fans and stream terraces consist predominantly of the Vaeda, Absher, and Nobe series. These soils tend to be moderately strong to strongly saline and sodic within 30 inches. Permeability is slow to very slow; therefore, water tends to runoff or puddle and evaporate. These soils have chemical properties which limit seed germination, vegetative composition, and production. Poor soil aeration is also a limitation. Associated ecological sites include: Dense Clay and Saline Uplands, 10 to 14 inch Ppt. zone, sedimentary plains, east. Total dry-weight production capability on these soils is low – ranging from 150 to 600 lbs. during normal years.

Alluvial soils on nearly level to gently sloping (0% to 8%) slopes along floodplains and stream terraces consist of the Aquic Ustifluvents – saline and Ustic Torrifluvents – gently sloping components. Soil properties are variable and can differ over short distances. These soils range from: sandy to clayey; poorly drained to well-drained; slightly saline/sodic to highly saline/sodic; and, slightly to highly erodible. See discussion in the Riparian Section about the effects these soils have on stream channel function and capability.

Soils developed from glacial till are on nearly level to moderately steep (1% to 25%) slopes and are typically very deep (>60 inches). Textures are loamy to clayey. Erosion is slight to moderate due to the relatively gentle rolling topography, short slope lengths, and prominence of dense sod-forming vegetation. When disturbed, water and wind erosion hazards increase. Predominant soils include the Elloam, Scobey, and Phillips, series. Associated ecological sites include: Clay pan Silty, Silty Steep, and Dense Clay, 10 to 14 inch Ppt. zone, glaciated plains, and central.

There are areas of barren or nearly barren land dissected by many drainage channels. Within these areas, there are exposures of consolidated sedimentary beds of shale.

Appendix 2-Soil Descriptions, provides a description of the major soils that occur in the soil map units. Descriptions of non-soil (miscellaneous areas) and minor components are not included.

Soils in the uplands provide for the capture, storage and safe release of water. Evidence of accelerated erosion in the form of rills and/or gullies, erosional pedestals, flow patterns, and compaction layers below the soil surface are minimal and match what are expected for a given Ecological Site. The 2011 Soil/Site Stability Attribute Ratings support this.

Riparian

Prior to 2008, streams on BLM managed lands in Valley County were assessed using the Montana Riparian/Wetland Association Method (MRWA) to rate functioning condition. In 2008, the Glasgow Field Office began using the approved BLM method of assessment called the Proper Functioning Condition (PFC) Method. The PFC Method was used by an interdisciplinary team of resource specialists (I.D. Team) during the 2011 field season to assess and record the riparian and wetland conditions in the Lower Little Beaver Watershed.

During the 2011 field season, the HiLine District's I.D. Team was able to conduct 34 miles of stream assessments on 4 streams that comprised 10 reaches flowing through 4 allotments in the Lower Little Beaver Watershed. The I.D. Team will continue assessing riparian areas during the 2012 and 2013 field seasons and will include their findings in the 2016 Lower Little Beaver Watershed Report.

Valuable wildlife habitat information is obtained through assessments of the riparian zones on BLM managed lands. The PFC method is implemented by the BLM in order to evaluate the condition of riparian vegetation and riparian function which indicate causes and sources of current and potential water quality issues. Riparian vegetation responds readily to changes in management and can be modified to produce conditions more favorable to stream stability and water quality. Achieving or maintaining PFC in riparian areas promotes the growth of deep-rooted riparian vegetation that dissipates streamflow energy, stabilizes streambanks from cutting action, and filters sediment. Proper functioning riparian areas have stable stream banks (low sediment input) that are well vegetated (low thermal loading). The functioning condition can indicate whether or not livestock are spending excessive time in or immediately adjacent to the waterway (low bacteria and nutrients). Riparian trends provide valuable information. Improving trends indicate that banks are becoming more stable (lower sediment load), shading is improving (less thermal loading), and livestock are spending less time in or immediately adjacent to the waterway (less bacteria or nutrients). Declining trends would likely denote the opposite.

A variety of riparian complexes and channel classifications are found within the Lower Little Beaver Watershed. As can be seen in Image 1, the Lower Little Beaver Watershed is capable of supporting riparian zones that function properly in all respects:

- 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 root masses that stabilize streambanks against cutting action;
- develop diverse ponding and channel characteristics to provide the habitat and the water depth, duration, and temperature necessary for fish production, waterfowl breeding, [and/or] other uses;
- support greater biodiversity.

The occurrence of riparian conditions portrayed in Image 1 is not common in the Lower Little Beaver Watershed. As can be witnessed in Image 2 and Image 3, channel incisement can occur rapidly and dramatically. In fact, nearly all of the major stream systems within the watershed now reside in an incised channel (similar to Figure 1 below) after having undergone sequences of morphological changes (See Figure 2).



Figure 1: Depiction of Incised Channel (Rosgen)

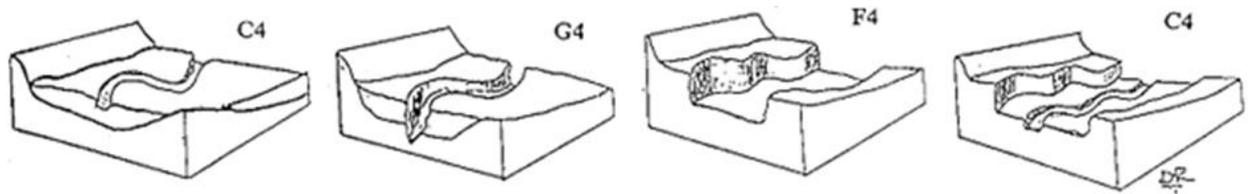


Figure 2: Sequence of Stream Type Occurrence Due to Morphological Change (Rosgen, 1996)

When a channel becomes incised, the water table, riparian zone, and floodplain are forced to reside at a lower elevation. In an area where runoff events can be flashy and where soils are erosive and often alkaline, vegetation establishment is hindered along the riparian zones and on floodplains that reside along an active stream channel within a larger channel.

Along inventoried areas that have been identified as non-functioning, or functioning at risk with a downward trend, root masses that stabilize streambanks against cutting action do not easily become established due to the steep grade of the cut, slumping, and sloughing banks. If assistive natural conditions prevail and vegetation does become established along these struggling riparian zones, high energy flow events tend to wipe the vegetation out, erode the soils around them, and/or cover the vegetation with dense sediment deposits. The absence of vegetation diminishes the potential for flood-water retention, therefore duration of saturation is lessened and progressive root-mass establishment is not fortified; essentially, only channel sinuosity remains to account for dissipation of the water's energy.

The soil complexes, bioclimate, topography, runoff potential (i.e., flashy and potentially heavy waterflow volumes), and land uses all influence the hydrologic and riparian conditions of this sensitive watershed. For the most part, the conditions of the Lower Little Beaver Watershed do not readily support large woody species (e.g., Cottonwood

(*Polypus deltoides*) and Peachleaf Willow (*Salix amygdaloides*)), although such species are found where fundamental conditions persist (i.e., accessible water table and an absence of physical stressors).



Image 1: Sage Hen Creek (PFC) 2011, Immediately Above Migrating Head Cut (1.59 Stream Miles below Judy Reservoir Outlet; 1.05 Miles Southeast of Judy Reservoir Outlet)



Image 2: Sage Hen Creek (FAR) 2011, Incised Channel Immediately Below Active Head Cut



Image 3: Sage Hen Creek (FAR) 2011, Looking Down Stream at Active Head Cut (6 ft. drop to water, 5 ft. deep pool)

Table 1 relates the most up-to-date Riparian PFC Data for the entire Lower Little Beaver Watershed.

Table 1

<u>Stream & Percentage of Total Stream Length Within the Lower Little Beaver Watershed</u>	<u>Allotment(s)</u>	<u>Condition & Trend</u>	<u>Year Assessed</u>	<u>Reach Length (miles)</u>
Coyote Creek (100%)	4574 & 4583	PFC	1998	5.93
Little Beaver Creek (34.00%)	4573	FAR (upward)	2004	8.57
Little Beaver Creek (13.17%)	4552 & 4574	FAR (upward)	2005	3.32
Little Beaver Creek (28.51%)	4583	FAR (upward)	2011	7.19
Little Beaver Creek (4.72%)	4583	FAR (downward)	2011	1.19
Little Beaver Creek (2.46%)	4583	NF	2011	0.62
Little Beaver Creek (17.14%)	4583	PFC	2011	4.32
Miller Coulee (14.04%)	4574 & 4583	FAR (upward)	2005	0.82
Miller Coulee (85.96%)	4574 & 4583	FAR (static)	2005	5.02
Mud Creek (100%)	4577	FAR (static)	2005	4.59
North Fork Little Beaver Creek (10.07%)	4551	PFC	1998	0.57
North Fork Little Beaver Creek (89.93%)	4552	FAR (static)	1998	5.09
Sage Hen Creek (22.15%)	4583	PFC	1998	2.08
Sage Hen Creek (19.91%)	4583	NF	2011	1.87
Sage Hen Creek (57.93%)	4574	FAR (upward)	2011	5.44

South Beaver Creek (100%)	4583	PFC	2004	1.98
South Fork Little Beaver Creek (100%)	4552	PFC	1998	3.91
Unnamed Tributary to Sage Hen Creek (100%)	4574	PFC	2011	1.03
Willow Creek (28.53%)	4567, 4583, & 4585	PFC	1998	10.86
Willow Creek (39.95%)	4583, 4584, 4585, & 4577	FAR (upward)	1998	15.21
Willow Creek (31.52%)	4567 & 4576	PFC	2011	12.00

Table 2 provides a comparison of riparian conditions exhibited within the Lower Little Beaver Washershed in 2011 versus what was on record in 1997. The reason for the addition of 15.5 miles between 1997 and 2011 is 1) The stream miles have been re-digitized (re-mapped and inherently lengthened) using aerial imagery from 2005 and 2009 to more accurately account for meander bends and overall stream sinuosity, and 2) Additional reaches that support hydrophytic vegetation have been inventoried and are now being monitored.

Table 2

	<u>FAR Up</u>	<u>FAR Static</u>	<u>FAR Downward</u>	<u>NF</u>	<u>PFC</u>	<u>Total</u>
2011						
Miles	40.55	14.70	1.19	2.49	42.68	101.61
Percent	39.91%	14.47%	1.17%	2.45%	42%	100%
1997						
Miles	1.9	51.7	0	0	32.5	86.1
Percent	2.21%	60.05%	0%	0%	37.75%	100%

Photos numbered 1-13 provide insight into the findings of the riparian assessments conducted in 2011. Photos 1A-15C have been collected at a monitoring site along Sage Hen Creek between 1995 and 2011.



Photo 1: Unnamed Tributary to Sage Hen Creek (PFC) 2011, Above Active Head Cut, Below Deep Cut Reservoir



Photo 2: Unnamed Tributary to Sage Hen Creek (PFC) 2011, Active Head Cut (0.68 Stream Miles Below Deep Cut Reservoir; 0.56 Miles South of Deep Cut Reservoir Outlet)



Photo 3: Little Beaver Creek (FAR-improving trend), R-428A



Photo 4: Little Beaver Creek (FAR-improving trend), R-428A



Photo 5: Little Beaver Creek (FAR-improving trend), R-428A



Photo 6: Little Beaver Creek (PFC), R-429A



Photo 7: Little Beaver Creek (PFC), R-429A



Photo 8: Little Beaver Creek (NF), R-437A



Photo 9: Little Beaver Creek (NF), R-437A



Photo 10: Sage Hen Creek (NF), R-206; Photo Taken at the Confluence of Coyote Creek and Sage Hen Creek in the Footprint of Blanchard Detention Dam



Photo 11: Willow Creek (PFC), R-417



Photo 12: Willow Creek (PFC), R-417 & R-441; Water Flows Out of Allotment 4576 (Off of R-441) and Into Allotment 4567 (Onto R-417)



Photo 13: Willow Creek (PFC), R-441



Photo 1A: Sage Hen Creek; Monitoring Site 1995



Photo 2A: Sage Hen Creek; Monitoring Site 1998



Photo 3A: Sage Hen Creek; Monitoring Site 2005



Photo 4A: Sage Hen Creek; Monitoring Site 2011



Photo 5B: Sage Hen Creek; Monitoring Site 1995



Photo 6B: Sage Hen Creek; Monitoring Site 1998



Photo 7B: Sage Hen Creek; Monitoring Site 2004



Photo 8B: Sage Hen Creek; Monitoring Site 2005



Photo 9B: Sage Hen Creek; Monitoring Site 2011



Photo 10C: Sage Hen Creek; Monitoring Site 1995



Photo 11C: Sage Hen Creek; Monitoring Site 1998



Photo 12C: Sage Hen Creek; Monitoring Site 2004



Photo 13C: Sage Hen Creek; Monitoring Site 2004



Photo 14C: Sage Hen Creek; Monitoring Site 2005



Photo 15C: Sage Hen Creek; Monitoring Site 2011

Water Resources

The Lower Little Beaver Watershed has a perimeter of roughly 128 miles that encompasses 143,363 acres, of which approximately 124,154 acres are BLM managed lands. The outline of the Lower Little Beaver Watershed has been delineated by the BLM and contains parts of four different watershed basins (Beaver, Fort Peck Reservoir, Prairie Elk-Wolf, and Lower Milk) identified by the U.S. Geological Survey.

The Beaver Watershed Basin makes up 3.71 percent, the Fort Peck Reservoir Watershed Basin makes up 2.71 percent, and Prairie Elk-Wolf Watershed Basin makes up 0.22 percent of the BLM delineated Lower Little Beaver Watershed. Neither of these three watershed basins includes portions of BLM assessed riparian zones.

The Lower Milk Watershed Basin makes up 93.36 percent of the Lower Little Beaver Watershed and contains all of the assessed riparian zones listed in Table 1.

The mean annual precipitation in the Lower Little Beaver Watershed is 11 (eleven) inches; 40 percent falls in May, June, and August while 25 percent falls as snow. Approximately 80 to 90 percent of the moisture that falls in the watershed is lost to evaporation and transpiration. The runoff in the watershed is composed of about 9 to 19 percent of the water that falls, while less than 1 percent of precipitation goes to recharge ground water aquifers.

The stream length measurements discussed in the following paragraphs were obtained from the State of Montana's 303(d)/305(b) Integrated Report Spatial Data and therefore do not match up 1 to 1 with the stream length measurements utilized by the BLM for riparian reaches.

The Lower Little Beaver Watershed encompasses 16.5 miles of Little Beaver Creek, of which 13.7 miles flow across BLM managed lands. The State's 303(d)/305(b) Integrated Report for 2012 indicates that Little Beaver Creek (from the confluence of Little Beaver Creek and the South Fork Little Beaver Creek to the confluence of Little Beaver Creek and Willow Creek) has one or more water uses that are impaired and a Total Maximum Daily Load (TMDL) is required.

The probable causes of impairment are alteration in stream-side or littoral vegetative cover, high nitrate and nitrite concentrations, and high suspended/bedload solids concentrations. The probable sources for these causes have been identified as impoundments, rangeland grazing, and natural. High metal concentrations (i.e., cadmium, iron, lead, copper, and zinc) were detected and have also been attributed to natural sources. The concentration of total dissolved solids is low. The water uses that have been identified as not being supported are aquatic life and warm water fishery. The DEQ identified minimal livestock pressure on sediment dominated substrate that is highly erosive in highly sensitive geologic terrain. The DEQ's remarks on the stream channel are that it is deeply incised, very sinuous, and the floodplain is narrow.

The State's 303(d)/305(b) Integrated Report for 2012 also indicates that 76.1 miles of Willow Creek (from the outlet of Halfpint Reservoir on BLM managed lands to the confluence of Willow Creek and the Milk River) has one or more water uses that are

impaired and a TMDL is required. The Lower Little Beaver Watershed encompasses 36.1 miles of Willow Creek, of which 27.1 miles flow across BLM managed lands. Willow Creek is a highly sinuous entrenched stream that vertically and laterally cuts into easily erodible soils. Sandbar (Coyote) Willow is the dominant vegetative species that serves to hold the channel walls in place during what can be very heavy intermittent flows and near perennial flow activity. Large boulders are not present except for very few glacial erratics (mostly on the uplands). Some gravel and cobbles are present in the streambed due to their inclusion in the streambank soils that can be disassembled by heavy streamflow events.

The beneficial water use that has been identified as not being supported is aquatic life. Some probable causes of impairment along Willow Creek are alteration in stream-side or littoral vegetative covers, flow regime alterations, physical substrate habitat alterations, and sedimentation and siltation. The DEQ's identified primary causes of water quality impairment include grazing in riparian or shoreline zones and the development of relatively large storage reservoirs that are poorly maintained.

The types of assessments implemented in order to determine water quality along Little Beaver Creek and Willow Creek include biological, habitat, physical, and chemical. The assessment methods integrated into water quality assessments include benthic macroinvertebrate surveys; fish surveys; information gathering from local residents; non-fixed station physical and chemical monitoring for conventional pollutants only; primary producer surveys for phytoplankton, periphyton, and macrophyton; and visual observations completed by State appointed professionals during a single season.

Wildlife

Grassland Bird Management;

The Lower Little Beaver Watershed continues to provide habitat for grassland birds, in particular those species associated with open habitats with little cover such as McCown's Longspur or Mountain Plover, or sage associated species such as Brewer's Sparrow and Greater Sage-grouse. The Candidate Species Sprague's pipit is less likely to occur here due to a lack of adequate grass height. Listing of the Sprague's pipit as a T&E Species was determined on 14 September 2010 to be warranted, but precluded due to the need to work on higher priority species. The Sprague's pipit thus became a Candidate Species with an annual status review to determine eligibility for listing. Recommendations from the initial Lower Little Beaver Watershed Assessment suggest converting non-native uplands to native vegetation and initiating a prescribed burn program to provide for grassland heterogeneity. Prescribed burns will probably not result in increased habitat for the species primarily associated with this watershed and will probably not be considered as a management tool for wildlife habitat in the watershed. Burning an area with a low annual precipitation rate (11 inches or less) can result in a delay of regrowth in response to drought cycles. A precipitation drop of only two inches or so below the average could delay regrowth for a couple of years. Species associated with open ground continue to find adequate habitat due to the soils and limited vegetation potential, but sagebrush associated species would potentially be detrimentally affected by burning of sagebrush.

Habitat assessments for Greater Sage-grouse (see below) will be utilized to determine if vegetation treatments are warranted for this watershed in order to improve habitat for all sage associated species. Some bird survey routes using Breeding Bird Survey (BBS) methodology and point counts have been initiated in a portion of this watershed to monitor birds breeding in south Valley County. These surveys have established baseline monitoring routes and points to assess habitat conditions for the species detected as well as baseline indicators of species composition and density.

Mountain Plover Habitat;

Mountain plovers are currently found in suitable habitat throughout the watershed. Two major management events concerning Mountain Plovers have occurred since the initial watershed report: The Mountain Plover ACEC record of decision was signed in 2003. This ACEC was designated to protect Mountain Plover populations in south Valley County and the management recommendations in the original watershed report were incorporated into the ACEC management plan. In addition, graduate research was conducted by Theresa Childers to provide further information on population size, habitat use, and reproductive success of this population of Mountain Plovers. The establishment of the ACEC also provides protection for the McCown's Longspur, a BLM Sensitive Species and Montana State Species of Concern associated with habitats used by Mountain Plovers. Formalized surveys to estimate abundance and trend of Mountain Plovers was initiated in the summer of 2010 in this area.

Waterfowl production;

Waterfowl production within this watershed continues to be mediated by water levels in the reservoirs. As noted in the original watershed report, waterfowl production is not enhanced by dense nesting cover but by the vastness of the cover surrounding breeding reservoirs. Recommendations in the original assessment suggest creating more waterfowl reservoirs; however increased concern with Greater Sage-grouse habitat and a greater emphasis on maintaining natural habitats in the watershed have overshadowed the need for increasing the number of waterfowl production reservoirs.

Prairie dog management;

No black-tailed prairie dog recommendations were made in the original watershed report. There are six prairie dog towns located within the watershed boundary for a total of 361 acres. Prairie dog habitat is limited in the watershed due to the soils present. The majority of the prairie dog towns are located in the southern portion of the watershed where soil conditions provide more desirable habitat for town establishment. Disease, not habitat, is the biggest factor that affects prairie dogs located in the watershed. The area has not been considered for black-footed ferret reintroductions due to the small active acreage.

Greater Sage-Grouse habitat;

The Greater Sage-grouse has become a major management concern for the BLM since the original watershed report. Listing of the greater sage-grouse as a T&E Species was determined in March of 2010 to be warranted, but precluded due to the need to work on higher priority species. The sage-grouse thus became a candidate species with an annual

status review to determine eligibility for listing. The Lower Little Beaver watershed is within the Montana Fish, Wildlife and Parks Core Area for greater sage-grouse and there are 20 leks (14 active leks, 3 unknown leks, and 3 inactive leks) located within the watershed boundary. All 14 active leks are monitored annually by BLM and MFWP. The mean maximum number of males on each lek has varied by year, ranging from a low 17 males/lek in 2005 to a high of 35 males /lek in 2009, but the overall trend is upward.

During the summers of 2008 and 2009 in an effort to quantify the quality of Greater Sage-grouse habitat in the Lower Little Beaverwatershed, the BLM completed habitat assessments around twelve leks (9 on active leks, 1 on unknown lek, and 2 on inactive leks). We randomly select sites within a 2 mile radius of the leks. Five to six points were selected around each lek, distributed among three mapped vegetation categories: sagebrush, grass, or other dominate vegetation. At each site line intercept transects and modified-Whittaker sampling plots were surveyed for vegetation identification, cover, and height.

Habitat for sage-grouse in the Lower Little Beaver watershed, according to the standards established by the Montana Sage-grouse Working Group, is considered unsuitable primarily because of low sagebrush cover. The standards do not reflect the average vegetation parameters of sage-grouse habitat when measured at larger scales. We feel the established standards are not applicable for the type and scale of monitoring needed for management purposes and also may not reflect the conditions in this region given the variance in soil type and climate. Also, sagebrush in this area may not be capable ecologically of meeting “suitable” habitat standards except in small patches.

Currently, the population of Greater Sage-grouse in the watershed and surrounding areas is relatively large, stable and appears to vary more with weather factors than with habitat conditions. This suggests that current habitat conditions, including quality, size, extent and landscape context, are currently suitable for sage-grouse. Connelly et al. (2000) suggested, “In all these cases, local biologists and range ecologists should develop height and cover requirements that are reasonable and ecologically defensible.” The sage-grouse habitat inventory work described above will be combined with habitat assessments and population indices in other watersheds throughout Valley County to establish local habitat standards which reflect conditions in areas with healthy Sage-grouse populations.



McCown's Longspur

Transportation, Recreation and VRM

Transportation and Signage

Off Highway Vehicle (OHV) travel on BLM public lands is regulated by the June 2003 Record of Decision (ROD) Off Highway Vehicle Environmental Impact Statement and Proposed Plan Amendment for Montana, North Dakota and South Dakota. This Record of Decision designated BLM lands as a limited area for OHV use. Limited area means an area restricted at certain times, in certain areas, and/or to certain vehicular use.

Furthermore, the approved preferred alternative in the ROD states that BLM will restrict motorized wheeled cross-country travel yearlong, which effectively limits motorized wheeled travel to existing roads and trails until site specific travel management plans are developed for high, medium, and low priority geographical areas.

BLM public lands within the Little Beaver Watershed area north and west of the Willow Creek Road are within a low priority travel management planning area and those public lands south and east of the Willow Creek Road are within a moderate travel management area. Site specific travel management planning will be initiated within five years of the date of the ROD for moderate priority areas and there are no specific time requirements for initiation of site specific planning for low priority areas. Therefore, until that travel management planning occurs, all motorized wheeled travel on BLM public lands will be restricted to existing roads and trails within the Little Beaver Watershed area. This decision applies to recreation and other general public use on BLM administered lands but allows BLM employees, other government entities, and grazing lessees and permittees motorized wheeled cross-country travel when performing administrative functions in managing the BLM public lands. Examples of grazing permittees

administrative functions include, but are not limited to: Checking vegetative conditions, building or maintaining fences, delivering salt and supplements, moving livestock, checking wells or pipelines as part of the implementation of a grazing permit or lease.

The BLM will ensure that appropriate signs and posters are used to promote safety and convenience for visitors and users, define boundaries, identify management practices, provide information about geographic and historic features and protect vulnerable land areas and resources from misuse. As per the Malta Field Office Sign Plan approved on 10/30/2003, off highway vehicle signing associated with implementing the June 2003 ROD for managing off highway vehicle travel within the Malta Field Office will continue along with informational signing of any recreation sites present or proposed for development within the Little Beaver Watershed area.

Recreation and Public Use

The BLM will maintain and/or enhance the recreational quality of BLM land and resources to ensure enjoyable recreational experiences. Recreation emphasis will be to develop and maintain opportunities for dispersed recreational activities such as hunting, fishing, scenic and wildlife viewing and driving for pleasure.

The grazing allotments within the Little Beaver Watershed area are within the South Valley Special Recreation Management Area (SRMA). Recreational use is dispersed and undeveloped with most visitation occurring during the fall hunting seasons. There are a few small fisheries within the watershed but currently no developed recreation facilities and none are proposed for construction in the near future. The TC Access Road and Willow Creek Road could be nominated to the Back Country Byways program, but public interest and the potential for funding this project is presently low.

Approximately six commercial outfitters are issued annual Special Recreation Permits (SRP) within the South Valley SRMA to guide their clients to hunt for big game, waterfowl, upland birds, and varmints during the fall and winter hunting season. In addition, this area is also popular for non-commercial hunters from Montana and throughout the United States and Canada.

Visual Resource Management

The BLM will manage activities (oil and gas production, range improvements, wind energy farms, etc) to comply with the Visual Resource Management (VRM) policy. The BLM land within the resource area has been assigned a VRM class based on a process that considers scenic quality, sensitivity to changes in the landscape and distance zone. The grazing allotments within the Little Beaver Watershed area fall within VRM Class II, III, and IV designations. The objectives for these three visual resource classes and the allotments they affect are:

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

4585, 4586 and 4587 are completely within a VRM Class II as is a portion of allotments 4577, 4583, 4584 and 4592.

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 should repeat the basic elements found in the predominant natural features of the characteristic landscape. Allotment 4567 is completely within the VRM Class III designation.

VRM class IV - The objective of this class 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. Allotments 4551, 4552, 4573, 4574, 4575 and 4576 are completely within the VRM Class IV designation as is a portion of allotments 4577, 4583, 4584 and 4592.

Cultural Resources

Cultural resources in this area are a part of the Great Plains geographical culture, both in terms of prehistoric and historic period peoples. Both historic and prehistoric resources are present here. Historic resources consist of sites associated with European farming expansion such as homesteads, cabins, railroads, and trails. Prehistoric resources consist of those sites associated with indigenous cultures, such as stone circles, lithic scatters, bison kills, and those areas used for religious and/or spiritual purposes.

Paleontological Resources

The Lower Little Beaver watershed area encompasses a large portion of southern Valley County. Small pockets within the watershed boundary are located in a Class V high probability area for paleontological resources. These pockets are located in an Upper Cretaceous and Hell Creek Formation.

Noxious and Invasive Weeds

Noxious weeds in the Lower Little Beaver watershed are a very minor problem and control efforts through a Cooperative Agreement with Valley County Weed District have kept Leafy Spurge, Russian Knapweed, and Spotted Knapweed to a minimum.

Annual Bromes' (*Bromus spp.*) such as Japanese brome (*Bromus japonicus*) and downy brome (*B. tectorum*) are non-native, weedy, cool-season annual grasses that have invaded native plant communities. Native plant communities which have been invaded lack forbs, tall cool season perennial bunchgrasses, plant diversity and vigor due to the dominance of annual bromes. Annual bromes also increase the risks of wildfires. Annual Bromes have spread significantly and are now commonly seen plants, especially in the Missouri Breaks portion of the watershed area.

Conclusion

The Lower Little Beaver Watershed is meeting the Standards for Rangeland Health in most allotments and where they are not currently meeting a Standard it is not livestock caused. The Lower Little Beaver watershed area has proven to be stable and resilient. A great deal of the credit for this should go to the permittees in this area. The system of permittee monitoring augmented by BLM monitoring has worked well. They have been very cooperative and proactive in their management and stewardship. Many of the permittees in this watershed are participating in some form of permittee monitoring which increases their awareness of the situation on the ground and what is expected of them in order for Standards for Rangeland Health to be met. This watershed can serve as an example for other watersheds in Valley County and beyond.

List of Preparers

Name	Title	Resource Responsibility	Narrative Into Document
Raymond Neumiller	Rangeland Management Specialist	Range/Project Lead	<i>/s/Raymond N. Neumiller 3/28/2012</i>
Josh Sorlie	Soil Scientist	Soils	<i>/s/Josh Sorlie 2/28/2012</i>
Jordan Thompson	Rangeland Management Specialist	Weeds/Invasive Species	<i>/s/ Jordan Thompson 3/1/2012</i>
Josh Chase	Archaeologist	Cultural/Paleontology	<i>/s/Josh Chase 2/27/2012</i>
Kathy Tribby	Outdoor Recreation Planner	Recreation/Transportation/VRM	<i>/s/Kathy Tribby 2/22/2012</i>
Fritz Prellwitz	Wildlife Biologist	Wildlife/Migratory Birds/Special Status Species	<i>/s/ Fritz Prellwitz 3/06/2012</i>

Literature Cited

Connelly, J.W., M.A. Schroeder, A.R. Sands, and C.E. Braun. 2000. Guidelines to manage Sage-grouse populations and their habitats. Wildlife Society Bulletin 28:967-985.

Appendix 1: Upland Photos



Allotment # 4551, Study S-2, 9/15/2011



Allotment # 4551, Study M-1, 9/15/2011



Allotment # 4551, Study W-2, 9/14/2011



Allotment # 4552, Study N-1, 9/15/2011



Allotment # 4573, Study S-1, 8/10/2011



Allotment # 4574, Study J-1, 7/28/2011



Allotment # 4574, Study T-2, 7/28/2011



Allotment # 4574, Study MC-1, 8/10/2011



Allotment # 4576, Study A-1, 9/28/2011



Allotment # 4577, Study A-1, 7/27/2011



Allotment # 4577, Study MC-2, 7/28/2011



Allotment # 4583, Study DC-2, 8/10/2011



Allotment # 4583, Study G-2, 8/10/2011



Allotment # 4585, Study B-1, 7/27/2011



Allotment # 4586, Study Upper Mud 1, 7/27/2011



Allotment # 4592, Study R-2, 7/27/2011

Appendix 2: Soil Descriptions

Map Unit Description (Brief, Generated)

Valley County, Montana

[Minor map unit components are excluded from this report]

Map unit: 1 - Absher-Vaeda complex, 1 to 5 percent slopes

Component: Absher (50%)

The Absher component makes up 50 percent of the map unit. Slopes are 1 to 5 percent. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AE014MT Dense Clay (dc) Rru 58a-e 10-14" P.z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent. The soil has a strongly saline horizon within 30 inches of the soil surface. The soil has a strongly sodic horizon within 30 inches of the soil surface.

Component: Vaeda (40%)

The Vaeda component makes up 40 percent of the map unit. Slopes are 1 to 5 percent. This component is on fans, terraces. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 60 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R058AE014MT Dense Clay (dc) Rru 58a-e 10-14" P.z. ecological site. Nonirrigated land capability classification is 6s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent. The soil has a moderately saline horizon within 30 inches of the soil surface. The soil has a moderately sodic horizon within 30 inches of the soil surface.

Map unit: 2 - Aquic Ustifluents, saline

Component: Aquic Ustifluents (95%)

The Aquic Ustifluents component makes up 95 percent of the map unit. Slopes are 0 to 3 percent. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat poorly drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is low. Shrink-swell potential is moderate. This soil is occasionally flooded. It is not ponded. A seasonal zone of water saturation is at 48 inches during April, May, June, July. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AE012MT Saline Lowland (sl) Rru 58a-e 10-14" P.z. ecological site. Nonirrigated land capability classification is 6w. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 8 percent. The soil has a strongly saline horizon within 30 inches of the soil surface. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Map unit: 6 - Cabbart-Delpoint complex, 9 to 35 percent slopes

Component: Cabbart (45%)

The Cabbart component makes up 45 percent of the map unit. Slopes are 9 to 35 percent. The parent material consists of residuum weathered from calcareous sandstone. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AE019MT Shallow (sw) Rru 58a-e 10-14" P.z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 13 percent. The soil has a slightly saline horizon within 30 inches of the soil surface. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Component: Delpoint (40%)

The Delpoint component makes up 40 percent of the map unit. Slopes are 9 to 35 percent. The parent material consists of residuum weathered from sandstone. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R058AE001MT Silty (si) Rru 58a-e 10-14" P.z. ecological site. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent.

Map Unit Description (Brief, Generated)

Valley County, Montana

Map unit: 7 - Elloam clay loam, 1 to 5 percent slopes

Component: Elloam (90%)

The Elloam component makes up 90 percent of the map unit. Slopes are 1 to 5 percent. This component is on till plains. The parent material consists of till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R052XC206MT Dense Clay (dc) 10-14" P.z. ecological site. Nonirrigated land capability classification is 6s. Irrigated land capability classification is 6s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent. The soil has a moderately saline horizon within 30 inches of the soil surface. The soil has a moderately sodic horizon within 30 inches of the soil surface.

Map unit: 8 - Elloam gravelly clay, 2 to 9 percent slopes

Component: Elloam (90%)

The Elloam component makes up 90 percent of the map unit. Slopes are 2 to 9 percent. This component is on till plains. The parent material consists of till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R052XC206MT Dense Clay (dc) 10-14" P.z. ecological site. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent. The soil has a moderately saline horizon within 30 inches of the soil surface. The soil has a moderately sodic horizon within 30 inches of the soil surface.

Map unit: 34 - Lisam-Dilts clays, 5 to 35 percent slopes

Component: Lisam (45%)

The Lisam component makes up 45 percent of the map unit. Slopes are 5 to 35 percent. The parent material consists of residuum weathered from clayey shale. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R058AE199MT Shallow Clay (swc) Rru 58a-e 10-14" P.z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent. The soil has a very slightly saline horizon within 30 inches of the soil surface.

Component: Dilts (40%)

The Dilts component makes up 40 percent of the map unit. Slopes are 5 to 35 percent. This component is on hillslopes. The parent material consists of residuum weathered from acid shale. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R058AE199MT Shallow Clay (swc) Rru 58a-e 10-14" P.z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 35 - Lisam-Dilts-Rock outcrop complex, 9 to 35 percent slopes

Component: Rock outcrop (40%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map Unit Description (Brief, Generated)

Valley County, Montana

Map unit: 35 - Lisam-Dilts-Rock outcrop complex, 9 to 35 percent slopes

Component: Lisam (30%)

The Lisam component makes up 30 percent of the map unit. Slopes are 9 to 35 percent. The parent material consists of residuum weathered from clayey shale. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R058AE199MT Shallow Clay (swc) Rru 58a-e 10-14" P.z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent. The soil has a very slightly saline horizon within 30 inches of the soil surface.

Component: Dilts (20%)

The Dilts component makes up 20 percent of the map unit. Slopes are 9 to 35 percent. This component is on hillslopes. The parent material consists of residuum weathered from acid shale. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R058AE199MT Shallow Clay (swc) Rru 58a-e 10-14" P.z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Map unit: 38 - Marias clay, 1 to 9 percent slopes

Component: Marias (95%)

The Marias component makes up 95 percent of the map unit. Slopes are 1 to 9 percent. This component is on lake plains. The parent material consists of clayey glaciolacustrine deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R058AE002MT Clayey (cy) Rru 58a-e 10-14" P.z. ecological site. Nonirrigated land capability classification is 4e. Irrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 8 percent. The soil has a slightly saline horizon within 30 inches of the soil surface. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Component: Marias (85%)

The Marias component makes up 85 percent of the map unit. Slopes are 2 to 8 percent. This component is on alluvial fans on plains. The parent material consists of clayey alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R058AE002MT Clayey (cy) Rru 58a-e 10-14" P.z. ecological site. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 8 percent. The soil has a slightly sodic horizon within 30 inches of the soil surface.

Map unit: 43 - Nobe clay

Component: Nobe (85%)

The Nobe component makes up 85 percent of the map unit. Slopes are 0 to 4 percent. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R053AE071MT Saline Upland (su) 10-14" P.z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent. The soil has a moderately saline horizon within 30 inches of the soil surface. The soil has a strongly sodic horizon within 30 inches of the soil surface.

Map Unit Description (Brief, Generated)

Valley County, Montana

Map unit: 47 - Phillips-Elloam complex, 1 to 9 percent slopes

Component: Phillips (50%)

The Phillips component makes up 50 percent of the map unit. Slopes are 1 to 9 percent. This component is on till plains. The parent material consists of till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R052XC217MT Silty (si) 10-14" P.z. ecological site. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 3e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 13 percent.

Component: Elloam (25%)

The Elloam component makes up 25 percent of the map unit. Slopes are 1 to 9 percent. This component is on till plains. The parent material consists of till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R052XC206MT Dense Clay (dc) 10-14" P.z. ecological site. Nonirrigated land capability classification is 6s. Irrigated land capability classification is 6s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent. The soil has a moderately saline horizon within 30 inches of the soil surface. The soil has a moderately sodic horizon within 30 inches of the soil surface.

Map unit: 49 - Phillips-Scobey complex, 2 to 9 percent slopes

Component: Phillips (50%)

The Phillips component makes up 50 percent of the map unit. Slopes are 2 to 9 percent. This component is on till plains. The parent material consists of till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R052XC217MT Silty (si) 10-14" P.z. ecological site. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 3e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 13 percent.

Component: Scobey (30%)

The Scobey component makes up 30 percent of the map unit. Slopes are 2 to 9 percent. The parent material consists of till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R052XC217MT Silty (si) 10-14" P.z. ecological site. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 3e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent.

Map unit: 55 - Rock outcrop

Component: Rock outcrop (80%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Map Unit Description (Brief, Generated)

Valley County, Montana

Map unit: 57 - Scobey clay loam, 1 to 9 percent slopes

Component: Scobey (90%)

The Scobey component makes up 90 percent of the map unit. Slopes are 1 to 9 percent. The parent material consists of till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R052XC217MT Silty (si) 10-14" P.z. ecological site. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 3e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent.

Map unit: 59 - Scobey-Sunburst clay loams, 5 to 25 percent slopes

Component: Scobey (50%)

The Scobey component makes up 50 percent of the map unit. Slopes are 5 to 15 percent. The parent material consists of till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R052XC217MT Silty (si) 10-14" P.z. ecological site. Nonirrigated land capability classification is 4e. Irrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent.

Component: Sunburst (30%)

The Sunburst component makes up 30 percent of the map unit. Slopes are 5 to 25 percent. The parent material consists of till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R052XC220MT Thin Hilly (th) 10-14" P.z. ecological site. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent. The soil has a slightly saline horizon within 30 inches of the soil surface.

Map unit: 60 - Sunburst clay loam, 9 to 35 percent slopes

Component: Sunburst (80%)

The Sunburst component makes up 80 percent of the map unit. Slopes are 9 to 35 percent. The parent material consists of till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R052XC220MT Thin Hilly (th) 10-14" P.z. ecological site. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent. The soil has a slightly saline horizon within 30 inches of the soil surface.

Map unit: 61 - Sunburst-Lisam complex, 9 to 35 percent slopes

Component: Sunburst (40%)

The Sunburst component makes up 40 percent of the map unit. Slopes are 9 to 35 percent. The parent material consists of till. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. This component is in the R052XC220MT Thin Hilly (th) 10-14" P.z. ecological site. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 10 percent. The soil has a slightly saline horizon within 30 inches of the soil surface.

Map Unit Description (Brief, Generated)

Valley County, Montana

Map unit: 61 - Sunburst-Lisam complex, 9 to 35 percent slopes

Component: Lisam (35%)

The Lisam component makes up 35 percent of the map unit. Slopes are 9 to 35 percent. The parent material consists of residuum weathered from clayey shale. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R052XC215MT Shallow Clay (swc) 10-14" P.z. ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent. The soil has a very slightly saline horizon within 30 inches of the soil surface.

Map unit: 68 - Thebo-Lisam clays, 2 to 15 percent slopes

Component: Thebo (50%)

The Thebo component makes up 50 percent of the map unit. Slopes are 2 to 15 percent. The parent material consists of residuum weathered from shale. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R058AE002MT Clayey (cy) Rru 58a-e 10-14" P.z. ecological site. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent.

Component: Lisam (40%)

The Lisam component makes up 40 percent of the map unit. Slopes are 3 to 15 percent. The parent material consists of residuum weathered from clayey shale. Depth to a root restrictive layer, bedrock, paralithic, is 10 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is very low. Shrink-swell potential is high. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R058AE199MT Shallow Clay (swc) Rru 58a-e 10-14" P.z. ecological site. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent. The soil has a very slightly saline horizon within 30 inches of the soil surface.

Map unit: 75 - Ustic Torrifluvents, gently sloping

Component: Ustic Torrifluvents (100%)

The Ustic Torrifluvents component makes up 100 percent of the map unit. Slopes are 0 to 5 percent. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is occasionally flooded. It is not ponded. A seasonal zone of water saturation is at 54 inches during April, May, June. Organic matter content in the surface horizon is about 2 percent. This component is in the R052XC207MT Overflow (ov) 10-14" P.z. ecological site. Nonirrigated land capability classification is 6w. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 8 percent.

Map unit: 76 - Vaeda silty clay

Component: Vaeda (95%)

The Vaeda component makes up 95 percent of the map unit. Slopes are 0 to 3 percent. This component is on fans, terraces. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is high. This soil is rarely flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is in the R058AE014MT Dense Clay (dc) Rru 58a-e 10-14" P.z. ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent. The soil has a moderately saline horizon within 30 inches of the soil surface. The soil has a moderately sodic horizon within 30 inches of the soil surface.