2014

Bitterroot Watershed Restoration Plan

Bitter Root Water Forum

3/19/2014

Acknowledgements

This Watershed Restoration Plan (WRP) was developed through collaboration amongst people invested in the conservation and restoration of the Bitterroot watershed. Special thanks to the Bitterroot National Forest; Clark Fork Coalition; Montana Fish, Wildlife & Parks; and Trout Unlimited, whose input helped shape this plan. The members of the Bitter Root Water Forum's Projects Committee also deserve recognition for their assistance in the construction and revision of the WRP. Finally, this WRP could not have been completed without support from the Montana Department of Environmental Quality, especially critical support provided from Water Quality Specialist, Laura Andersen.

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SECTION 1.0 – INTRODUCTION

Montana's Bitterroot watershed, located in the Rocky Mountains of western Montana, covers nearly 3,000 square miles and includes all of Ravalli County and a small (southern) portion of Missoula County.

The economy and the quality of life in the Bitterroot Valley depend on ensuring a healthy Bitterroot watershed that will always provide clean, abundant water for this and future generations, which in turn requires monitoring, protecting, and improving our water quality and quantity.

The Bitter Root Water Forum (BRWF) was established in 1993 as an educational and discussion forum for water users of all types in the Bitterroot watershed. We have since evolved into a collaborative watershed group dedicated to ensuring clean water for future generations.

We are working for the day when:

- Residents and visitors appreciate how integral the Bitterroot River is to the valley's social, ecological, and economic well-being and make caring for and protecting the river a top priority.
- Urban and rural neighbors work together, using science and local wisdom, to proactively and continually maintain and improve water quality in our watershed.
- The Bitterroot River system continues to provide for diverse uses while achieving its potential as a world-class fishery and top-quality aquatic habitat.

BRWF's Watershed Restoration Plan (WRP) is based upon the principles derived by our founders in 1993 and reflects our continued commitment to restore and protect the Bitterroot watershed through education and restoration projects. Honoring our founder's dedication to a science-based approach, much of the information used to guide the development of this WRP is derived from existing data reported in the Total Maximum Daily Load (TMDL) documents prepared by the Montana Department of Environmental Quality (DEQ), the Bitterroot Subbasin Plan for Fish & Wildlife Conservation (Subbasin Plan), Montana impaired waterbodies as reported in the 2012 Integrated Report, and other planning and report documents for the Bitterroot watershed.

This WRP is designed to coordinate our watershed restoration efforts and implement the steps necessary to sustain future restoration projects and long-term education. We honor traditional goals of bringing people together to understand our watershed. We also strive to perfect our current goal of developing a plan for working with our community to preserve and protect our aquatic resources and wildlife habitat.

Under the 1987 amendments to the federal Clean Water Act, Section 319, the U.S. Environmental Protection Agency (EPA) provides funding to states to mitigate nonpoint

source (NPS) pollution (i.e., pollution arising from diffuse sources such as land runoff, precipitation, atmospheric deposition, drainage, seepage, or manmade changes to natural water flow). In Montana, these funds are distributed by DEQ; in 2012, BRWF received a Section 319 grant from DEQ to produce this watershed restoration plan (WRP) for portions of the Bitterroot watershed. Although many different components may be included in a plan, EPA lists nine key elements critical for achieving water quality improvements and which must be included in all WRPs supported with Section 319 funding. The elements are listed in Figure 1.1and are included in this WRP.

1.1 NINE MINIMUM ELEMENTS OF AN EPA WATERSHED RESTORATION PLAN

1. **Identification of causes of impairment and pollutant sources or groups of similar sources that need to be controlled to achieve needed load reductions, and any other goals identified in the watershed plan. (Section 4)**
2. **An estimate of the load reductions expected from management measures. (Section 6)**
3. **A description of the nonpoint source management measures that will need to be implemented to achieve load reductions in number 2, and a description of the critical areas in which those measures will be needed to implement this plan. (Section 5)**
4. **Estimate of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon to implement this plan. (Section 7)**
5. **An information and education component used to enhance public understanding of the project and encourage their early and continued participation in selecting, designing, and implementing the nonpoint source management measures that will be implemented. (Section 8)**
6. **Schedule for implementing the nonpoint source management measures identified in this plan that is reasonably expeditious. (Section 5, Table 5.4)**
7. **A description of interim measurable milestones for determining whether nonpoint source management measures or other control actions are being implemented. (Section 5, Table 5.5)**
8. **A set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made toward attaining water quality standards. (Section 10)**
9. **A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under item 8 immediately above. (Section 9)**

This WRP provides a broad overview of how BRWF hopes to address water quality concerns in the Bitterroot watershed. It is meant to be a living document and will be amended periodically as water quality issues are resolved or as new ones arise. The BRWF will maintain a five-year work plan to guide efforts at the project level. The work plan will be reviewed and updated annually.

1.2 PROCESS

In an effort to embrace local knowledge and include priorities beyond those of BRWF, we invited interested parties to assist in developing the WRP. Prioritization and planning assistance was provided by stakeholders that included: the Bitterroot National Forest: Clark Fork Coalition; Montana Fish, Wildlife & Parks; and Trout Unlimited. These stakeholders met to discuss current and hoped-for projects and to share information regarding restoration opportunities and plans within the watershed.

The purpose of the WRP is to develop a strategic and achievable approach to restoration and education efforts. In order to do this, BRWF and stakeholders selected priority areas of focus within the Bitterroot watershed. While the process of choosing priority areas was influenced heavily by TMDLs as well as recommendations from the Subbasin Plan, additional factors, including social aspects and history, were also considered. Key questions included

- *Is there currently momentum toward restoration in the subwatershed?*
- *Do any partners have connections and relationships with landowners in the area?*
- *What conservation efforts have landowners historically engaged in and how can we further educate about opportunities for restoration?*

By collectively discussing organizational priorities and initiatives, we were able to uncover overlapping priorities and overlapping "streams of interest."In turn, stakeholders prioritized several streams, which will be the focus of the plan and the focus of our restoration efforts and partner organizations for the next 5 years. The priority streams are categorized into two levels: **Level 1** includes streams that currently have restoration momentum and for which we envision good progress being made over the next 5 years to achieve goals outlined in the WRP. **Level 2** includes streams for which stakeholders would like to pursue projects when opportunities arise.

The seven streams included in this WRP include:

Level 1 Streams (identified with an asterisk throughout this WRP):

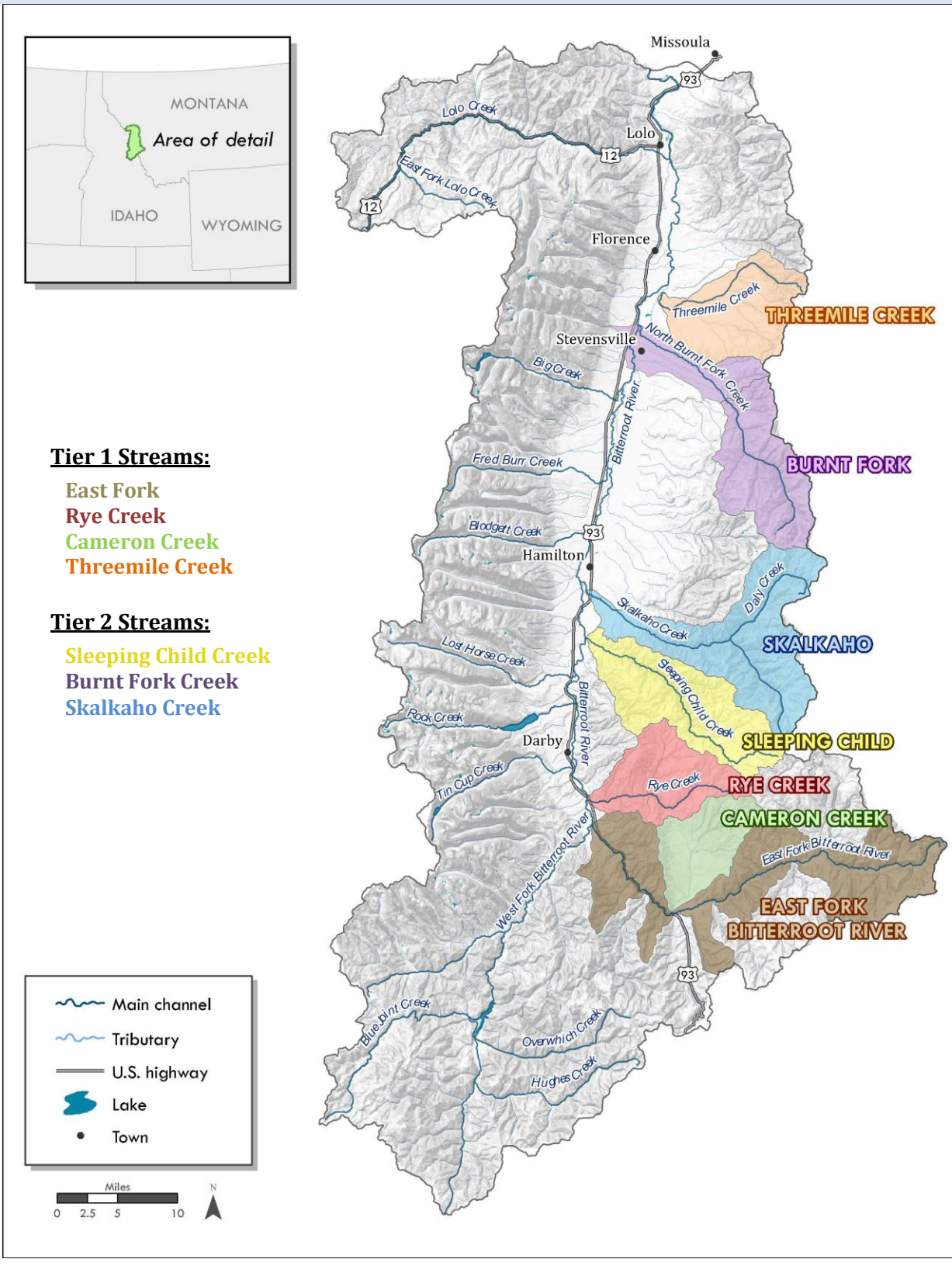
- East Fork Bitterroot River*
- Rye Creek*
- Cameron Creek*
- Threemile Creek*

Level 2 Streams:

- Sleeping Child Creek
- Burnt Fork Creek
- Skalkaho Creek

While BRWF was a lead organization in drafting the WRP, some of the restoration actions and projects addressed in this plan will be completed by other partners and organizations working in the Bitterroot watershed.

1.3 MAP OF SEVEN PRIORITY STREAMS IN THE BITTERROOT WATERSHED



1.4 WRP DESIGN

This WRP is designed to give readers a better sense of the current state of priority subwatersheds and the recommended actions needed to begin addressing impairments. A brief background on characteristics of each subwatershed and the intentions of the WRP are provided for better understanding each subwatershed and why we are addressing restoration and education needs at this time. The impairments, management needs, and benefits of the management actions are described for each subwatershed, followed by descriptions of the technical and financial assistance needed to accomplish the tasks recommended in the WRP, associated education and outreach, monitoring, and criteria for evaluating success.

The actions listed in this first edition of the WRP will take place in 2014–2019. Because the WRP is intended to be a living document, specific projects will be added to the Schedule for Implementation as they are identified; the WRP will be revised every 5 years to include new information, completed restoration actions, and additional plans for the next 5 years. We hope this structure and format will create a user-friendly guide to restoration efforts in the Bitterroot watershed for years to come.

SECTION 2.0 – DESCRIPTION OF THE WATERSHED

Located in the Rocky Mountains of western Montana, the Bitterroot watershed encompasses 2,899 square miles. It is bordered by the crest of the Bitterroot Mountains to the west, the crest of the Sapphire Mountains to the east, the headwaters of the Bitterroot River to the south at Lost Trail Pass on the Idaho–Montana border, and the confluence of the Bitterroot River with the Clark Fork River to the north in Missoula County. The watershed is contained within Ravalli County, with just a small portion of its northern boundary falling within southern Missoula County.

The Bitterroot watershed is characterized by a wide valley and meandering river channel with riparian forest and floodplain. The watershed includes high, glaciated mountains with alpine ridges at higher elevations and glacial and lake basins at lower elevations. Elevations range from 10,131 feet at Trapper Peak in the Bitterroot Mountain Range to 3,120 feet on the valley floor.

Figure 2.0High glaciated mountains with alpine ridges and lower elevation lake basin. Photo taken above Tin Cup Lake, courtesy of M. Hoyt, 2011

The Bitterroot watershed is complex and diverse for a number of reasons:

1. **Tributarie**s **–**More tributaries enter the mainstem of the Bitterroot River per river mile than any other major river in Montana.
2. **Irrigation –** Established in the late 1800s, the irrigation system comprises several irrigation districts and is one of the largest and most complex in Montana.
3. **Land ownership –** The irrigation system supported early subdivision of lands into small agricultural parcels, setting the stage for fragmentation of private lands. Conversely, most high-elevation areas are public land; ownership includes the U.S. Forest Service and state of Montana.
4. **Demographics –** High growth rates and corresponding demographic trends have shifted the economics of Ravalli County to less of an emphasis on traditional agriculture and timber industries. In addition, a portion of the watershed lies within Missoula County as well as the city of Missoula.

2.1 - EAST FORK BITTERROOT RIVER

The East Fork of the Bitterroot River (East Fork) originates high in glaciated basins of the Sapphire Mountains. Some basins are composed of metasedimentary rocks of the Belt Series and others of granitic bedrock. Thus, glacial and alluvial deposits of mixed origins and sandy materials from granitic bedrock influence substrates of the East Fork. The East Fork flows alternately through low-gradient montane valleys and confined narrow valleys, intermittently transporting sediment and then depositing it in low-gradient reaches that run primarily through private land. The East Fork bends at its midpoint and flows north to meet the West Fork of the Bitterroot River. Below the confluence, the valley narrows, and smaller tributaries flow through moderate- to high-relief landforms, routing runoff and sediments from weathered granitic outcrops to the mainstem of the Bitterroot River. The East Fork and the mainstem Bitterroot River are important migratory corridors for river bull trout and westslope cutthroat trout. Fish move between over-wintering habitat in the mainstem Bitterroot and spawning and rearing habitat in the upper East Fork. Restoration actions will focus on reducing the negative effects to riparian areas of Highway 93 and associated development.

2.2 - RYE CREEK

Rye Creek originates on the east side of the valley in the Sapphire Mountains and enters the Bitterroot River 6miles south of the town of Darby. Rye Creek, a 63-square-mile subwatershed, is naturally sensitive because of its geology and weathered granitic soils, which easily erode. Most of the land is public (Bitterroot National Forest), though private land comprises 15 square miles of the Rye Creek watershed. The privately owned portion has a high road density and high levels of past timber harvest; some areas show evidence of other activities, including farming, livestock grazing, and mining. Restoration actions here will complement restoration in the neighboring Skalkaho and Sleeping Child subwatersheds to create a large block of improved habitat for focal fish species on the eastside of the Bitterroot watershed.

2.3 - CAMERON CREEK

Cameron Creek is located in the upper headwaters of the Bitterroot watershed near Sula and originates in the Sapphire Mountains on the east side of the Bitterroot Valley. It flows south through the Bitterroot National Forest and a mix of public and private land before draining into the East Fork Bitterroot River. Cameron Creek provides spawning and rearing habitat for a widely distributed population of westslope cutthroat trout, which is threatened by poor habitat quality in the lower half of Cameron Creek arising from high sediment loads and elevated water temperatures (Jakober, 2011). While Cameron Creek is not listed on Montana's 303(d)list of impaired waters, it is a source of elevated sediment loads and unnaturally warm water flowing into the East Fork, which itself is listed for sediment and temperature impairments. No bull trout permanently live in the Cameron Creek drainage; however, an incidental bull trout has been known to enter the lower mile of Cameron Creek to hold and feed for short periods of time (several weeks) during their upstream spawning migration in the East Fork (Jakober, 2011). Restoration actions will include habitat improvements that could enhance the populations of fluvial westslope cutthroat in the East Fork.

2.4 - THREEMILE CREEK

Threemile Creek flows in northeast Ravalli County, originating in the Sapphire Mountains and flowing in a general westward direction through a mixture of public and private land for 12 miles before entering the Lee Metcalf Wildlife Refuge and joining the Bitterroot River north of Stevensville. Upper Threemile Creek drains into the Threemile Wildlife Management Area managed by Montana Fish, Wildlife& Parks. In the late 1990s, the Ravalli County Sanitarian's Office conducted a study of NPS pollution issues within 10 priority subwatersheds of the Bitterroot River and ranked Threemile Creek highest in concentration of nutrients and lowest in aquatic habitat quality and biological integrity (McDowell and Rokosch, 2005). Restoration actions will focus on measures that reduce sediment delivery to the stream.

2.5 - SLEEPING CHILD CREEK

Sleeping Child Creek is located south of Hamilton near Skalkaho Highway. Originating in the Sapphire Mountains, the creek runs for 24 miles before joining the Bitterroot River. The Creek contains decent bull trout and westslope cutthroat trout populations, with an abundance of good spawning and rearing habitat, creating the potential for improving these populations and connecting to other population strongholds in the Bitterroot River. Restoration activities will focus on improvements that could enhance the populations and migratory capacity of native trout.

2.6 - BURNT FORK CREEK

Burnt Fork Creek originates high in the Sapphire Mountains on the east side of the Bitterroot Valley and flows northwest through the Bitterroot National Forest before reaching a mix of private and public land and its eventual confluence with the Bitterroot River at the Lee Metcalf National Wildlife Refuge. The subwatershed is 85.9 square miles and is home to several fish and bird species of management concern. Recreational interest includes a bull trout and westslope cutthroat trout fishery. A diversity of wildlife and migratory birds, including various waterfowl species, also creates opportunities for wildlife watching and waterfowl hunting. The lower three miles of Burnt Fork Creek meander through the scenic Lee Metcalf Wildlife Refuge, which provides spectacular fishing, hunting, bird-watching, wildlife viewing, and hiking opportunities, drawing both local recreationists and out-of-state visitors to western Montana. Restoration activities will be led by Trout Unlimited and include management measures that enhance trout habitat as well as the overall health of the stream.

2.7 - SKALKAHO CREEK

The Skalkaho Creek drainage is a large subwatershed of approximately 132 square miles. Originating high in the Sapphire Mountains, Skalkaho Creek flows nearly 28 miles west-northwest through agricultural lands and smaller private parcels before reaching the Bitterroot River. On portions of Bitterroot National Forest land, Skalkaho Creek contains healthy populations of bull trout and westslope cutthroat trout; however, on downstream private lands, native trout diminish and exotic trout (brook, brown, and rainbow) increase. The Subbasin Plan indicates that, "Upper Skalkaho Creek is a native fish stronghold and supports the best bull trout and westslope cutthroat trout populations on the eastside of the Subbasin" (page 38). Restoration actions will provide potential for expanding habitat for native species strongholds in the upper reaches of Skalkaho Creek.

2.8 - TRIBUTARIES

Tributaries directly contribute to the health of these priority creeks; because BRWF is focusing on the overall health of each of the subwatersheds listed in this WRP we will also consider addressing pollutants on degraded tributaries

SECTION 3.0 – IMPAIRMENTS AND TOTAL MAXIMUM DAILY LOADS (EPA Element #1)

Every 2 years per federal requirement, DEQ compiles the Integrated Report (IR), which includes a list of waterbodies that are failing to meet water quality standards. Known as the 303(d) list, it notes impaired and threatened waterbodies throughout Montana. The list also includes information on impairments and their known or probable causes. Thirty-eight streams in the Bitterroot watershed are included in the 2012 IR. Much of the information regarding probable causes of impairments and suspected sources of pollution within subwatersheds was derived from the IR, published by DEQ. Although Cameron Creek has not been officially included on the impaired waters list, monitoring and assessment efforts demonstrate that it is a stream of concern in the Bitterroot watershed (Jakober, 2011).

A TMDL is the maximum amount of a pollutant that a waterbody can receive and still meet its water quality standards. Thus, a TMDL calculates the maximum amount of a pollutant allowed to enter a waterbody so that the waterbody will meet, and continue to meet, water quality standards for that particular pollutant. Each of the priority streams in this WRP is a stream of concern for one or more pollutants, including sediment, temperature, metals, nitrogen, nitrates, phosphorous, or low flow. The two most common problems among priority streams are increased sediment and temperature.

This section of the WRP lists specific impairments and contributing factors for each priority subwatershed. Also included is a chart highlighting the pollutant category, affected beneficial uses, and status of the TMDL. Beneficial uses are desirable uses that water quality should support (e.g., drinking water, recreation, aquatic life, etc.). Each designated use has a unique set of water quality requirements that must be met for the use to be realized.

3.1 WATERBODY IMPAIRMENTS, PROBABLE CAUSES, IMPAIRED USES AND TMDL STATUS

Waterbody & Location	Impairment	TMDL Pollutant Category	Impaired Beneficial Use	TMDL Complete
East Fork Bitterroot River* (headwaters to confluence with West Fork)	Flow Alteration	Temperature	Aquatic Life, Cold Water Fishery	Yes
	Siltation	Sediment	Aquatic Life	Yes
	Copper	Metal	Aquatic Life	Under Development
Factors contributing to impairments	• Alteration in stream-side or littoral vegetative covers • Channelization • Grazing in riparian or shoreline zones • Highways, roads, bridges, and infrastructure (new construction) • Streambank modifications/destabilization • Watershed runoff following forest fire			
Rye Creek* (North Fork to mouth at the Bitterroot River)	Sedimentation/Silt ation	Sediment	Aquatic Life, Cold Water Fishery	Yes
	Nitrogen (Total)	Nutrients	Aquatic Life	Under Development
	Phosphorus (Total)	Nutrients	Aquatic Life	Under Development
Factors contributing to impairments	• Alteration in stream-side or littoral vegetative covers • Animal feeding operations • Grazing in riparian or shoreline zones • Forest roads (road construction and use) • Silviculture activities			
Cameron Creek*(below Forest Service Road 311 to the confluence with East Fork)	Temperature (water)	Temperature	Aquatic Life	No
Factors contributing to impairments	• Shade loss (removal of riparian vegetation) • Historical land use practices, including clearing and burning for agriculture • Channelization • Grazing in riparian or shoreline zones • Streambank modifications and destabilization			

Waterbody & Location	Impairment	TMDL Pollutant Category	Impaired Beneficial Use	TMDL Complete
Threemile Creek*(headwaters to mouth at the Bitterroot River)	Sedimentation/Siltation	Sediment	Aquatic Life, Coldwater Fishery	Yes
	Nitrogen (Total)	Nutrients	Aquatic Life	Under Development
	Nitrate/Nitrite (Nitrite + Nitrate as N)	Nutrients	Aquatic Life	Under Development
	Phosphorus (Total)	Nutrients	Aquatic Life	Under Development
Factors contributing to impairments	• Agriculture • Rangeland grazing • Irrigated crop production			
Sleeping Child Creek (headwaters to mouth at the Bitterroot River)	Temperature (water)	Temperature	Aquatic Life, Coldwater Fishery	Yes
	Sedimentation/ Siltation	Sediment	Aquatic Life, Coldwater Fishery, Primary Contact Recreation	Yes
	Nitrogen (Total)	Nutrients	Aquatic Life	Under Development
	Phosphorus (Total)	Nutrients	Aquatic Life	Under Development
Factors contributing to impairments	• Agriculture • Silviculture activities • Highway/Road/Bridge Runoff (non-construction related)			
North Burnt Fork Creek (confluence with South Burnt Fork Creek to mouth at the Bitterroot River)	Bottom Deposits	Sediment	Aquatic Life, Coldwater Fishery	Yes
	Nitrogen	Nutrients	Aquatic Life	Under Development
	Phosphorus (Total)	Nutrients	Aquatic Life	Under Development
Factors contributing to impairments	• Grazing in riparian or shoreline zones • Irrigated crop production			

Waterbody & Location	Impairment	TMDL Pollutant Category	Impaired Beneficial Use	TMDL Complete
Skalkaho (headwaters to mouth at the Bitterroot River)	Low-Flow Alterations	Temperature	Aquatic Life	No
	Mercury	Metals	Drinking Water	No; delisting for metals in 2014
Factors contributing to impairments	• Agriculture • Irrigated crop production			

SECTION 4.0 –DESCRIPTION OF NONPOINT SOURCE MANAGEMENT MEASURES NEEDED (EPA Elements #3, #6, #7)

This section includes a description of the NPS management measures needed to begin achieving the load reductions described in Section 6 and a description of the critical areas where this WRP proposes implementing those measures. The recommendations described here were derived from the Subbasin Plan, which was developed by a number of regional organizations in 2009 to collectively assess subwatersheds and provide recommendations for conservation actions. The Subbasin Plan includes a comprehensive list of management needs, and we used the plan as a guide for selecting and prioritizing projects for this WRP's 5-year work plan.

Specific projects and management needs may change over time as new opportunities or threats arise. Table 4.4includes a detailed list of restoration projects that can be implemented in the near future along with an implementation schedule. However, if priorities change, necessary NPS management measures will be adjusted accordingly.

BRWF focuses largely on projects that address sediment impairments, which usually results in a benefit to temperature impairments as well. When BRWF develops plans to address sediment, temperature considerations and implications are always taken into account and treated to the best of our ability. For some streams, special considerations were made to address aquatic species of concern, and specific recommendations to improve fisheries are included.

Table 4.1. MANAGEMENT MEASURES NEEDED TO REDUCE SEDIMENT

	Priority Streams						
Management Measure	**East Fork***	**Rye***	**Cameron***	**Threemile***	**Sleeping Child**	**Burnt Fork**	**Skalkaho**
Develop integrated subwatershed map showing protected areas, classification of human effects, wetlands, and other resource values to aid in project planning and prioritization	X	X	X	X	X	X	X

	Priority Streams						
Management Measure	**East Fork***	**Rye***	**Cameron***	**Threemile***	**Sleeping Child**	**Burnt Fork**	**Skalkaho**
Improve grazing practices via grazing BMPs, installing riparian fencing, etc.	X	X	X	X	X	X	
Create and enhancefloodplain wetlands;restore riparian vegetation	X	X	X	X	X	X	X
Protect riparian habitats via conservation easements, landowner incentives, management plans, etc.	X	X	X	X	X	X	X
Develop riparian and stream education and outreach programs	X	X		X	X	X	X
Decommission roads, implement road BMPs	X	X		X			
Enhance and/or restorestream flow (revegetate and/or stabilize banks)	X	X	X	X	X	X	X

Table 4.2. MANAGEMENT MEASURES NEEDED TO REDUCE TEMPERATURE

	Priority Streams						
Management Measure	**East Fork***	**Rye***	**Cameron***	**Threemile***	**Sleeping Child**	**Burnt Fork**	**Skalkaho**
Develop integrated subwatershed map showing protected areas, classification of human effects, wetlands, and other resource values to aid in project planning and prioritization	X	X	X	X	X	X	X
Assess and mitigate nonpoint thermal pollution	X	X	X	X	X	X	X
Improve grazing practices (manage grazing, install riparian fencing, etc.)	X	X	X	X	X	X	
Protect riparian habitats (conservation easements, landowner incentives, management plans, etc.)	X	X	X	X	X	X	X
Develop riparian and stream education and outreach programs	X	X		X	X	X	X

	Priority Streams						
Management Measure	**East Fork***	**Rye***	**Cameron***	**Threemile***	**Sleeping Child**	**Burnt Fork**	**Skalkaho**
Enhance and/or restorestream flow (revegetate and/or stabilize)	X	X	X	X	X	X	X
Increase irrigation efficiencies	X				X		

Table 4.3. MANAGEMENT MEASURES NEEDED TO IMPROVE FISH POPULATIONS

	Priority Streams						
Management Measure	**East Fork***	**Rye***	**Cameron***	**Threemile***	**Sleeping Child**	**Burnt Fork**	**Skalkaho**
Remove barriers to migration and habitat use	X		X	X	X	X	X
Eliminate fish entrainment in ditches	X				X	X	X
Provide cold water refugia from tributaries to support species movement	X				X	X	X
Restore habitat diversity to support naturally-functioning, sustainable populations	X		X		X		X
Improve instream flows	X					X	X

TABLE 4.4. SCHEDULE FOR IMPLEMENTATION

Table 4.4 includes a schedule for implementing current NPS management measures that we have identified to date. As other projects materialize, they will be added to the implementation schedule.

Boxes highlighted in grey indicate when action will be taken.

Measurable Milestones	2014	2015	2016
Decommission 100 miles of Road: Rye Creek			
• Secure funding for implementation			
• Begin implementation			
Reduce livestock grazing effects: Cameron Creek			
• Monitor riparian fencing installed in 2013			
Increase Stream shading: Cameron Creek			
• Design a plan for plant/tree installation			
• Secure funding for plant/tree installation			
• Install plants/trees			
Implement streambank stabilization and riparian vegetation: Rye Creek			
• Secure funding for implementation			
• Complete restoration design			
• Implement project			
Reduce effects of encroaching U.S. Highway 93 by increasing riparian vegetation: East Fork			
• Secure funding for riparian planting			
• Implement riparian planting project			
Further Inventory and assess diversions: Burnt Fork			
• Inventory data gaps			
• Collect flow and temperature data above barriers			
Education and Outreach, Cameron Creek, East Fork: Burnt Fork			
• Site visits and tours of completed Cameron Creek projects			
• Site visits and tours of completed East Fork projects			
• Educational presentation to the Sula Community Club			
• Assist Stevensville High School students and teachers in additional monitoring on Burnt Fork Creek			
Education and Outreach: Threemile Creek, Rye Creek			
• Landowner meetings on Threemile Creek			
• Site visits highlighting existing conditions and recommended BMPs to reduce sediment delivery on Rye Creek			

TABLE 4.5. MEASURABLE MILESTONES

Restoration Strategy	Location	Timing	Lead Partners	Approximate Cost	Impairments Addressed
Decommission 100 miles of road	Rye Creek	2015	BNF	$1,000/mile	Sediment
Reduce livestock grazing effects through management of fencing and grazing	Cameron Creek	Fall 2014	BRWF	$3,500	Sediment
Increase stream shading through riparian revegetation	Cameron Creek	Spring 2015	BRWF	$7,500	Temperature
Riparian planting to provide shade to the stream	Doran Creek	Spring/Fall 2014	BRWF	$7,000	Temperature
Restore streambank and revegetate riparian areas	Rye Creek	Fall 2015	BRWF	$65,000	Sediment and Temperature
Reduce effects of encroaching U.S. Highway 93 by increasing riparian vegetation	East Fork	Spring and Fall 2014	BRWF and MDT	$12,000	Sediment
Further inventory and assess diversions	Burnt Fork	Spring 2014	TU, CFC	$7,500	Fish Passage
Implement education and outreach projects	Cameron Creek, Rye Creek, East Fork	Summer and Fall 2014	BRWF	$2,500	Water Quality
Implement education and outreach projects	Threemile Creek, Burnt Fork Creek	Summer and Fall 2015	BRWF	$2,500	Water Quality

SECTION 5.0 - LOAD REDUCTION ESTIMATES (EPA Element #2)

One of BRWF's main goals is to improve water quality such that all waterbodies in the Bitterroot watershed are supporting all of their beneficial uses. We expect the management measures called for in this WRP will help achieve some of the load reductions identified in the TMDLs. The load reduction needs for each subwatershed shown in Tables 5.1–5.7 are derived from the Bitterroot River Headwaters TMDLs (Water Quality Restoration Plan and TMDLs for the Bitterroot Headwaters Planning Area, MDEQ, 2005) and the Bitterroot River Mainstem TMDLs (Bitterroot Temperature and Tributary Sediment Total Maximum Daily Loads and Framework Water Quality Improvement Plan, MDEQ, 2011). Each subwatershed has a table describing the necessary load reductions to meet TMDLs and the amount of reductions that BRWF believes can be realistically achieved within 5 years.

**When TMDLs were developed in the Bitterroot watershed, DEQ took care to include potential disturbances from construction sites that may affect sediment contributions within subwatersheds by including the caveat: "This allocation represents the maximum allowable load under the constraints of the current Stormwater Construction permit." Stormwater construction permits are point-source sediment permits required for construction sites. The sites are mainly theoretical (i.e., not currently being disturbed but could be if a permit is awarded); however, construction could eventually take place, so in the TMDL, DEQ incorporated the potential for sediment contribution. The numbers reflect mitigations and BMPs being applied and also assumes that only a portion of the potential sites would be disturbed at any one time.*

5.1 – EAST FORK BITTERROOT RIVER

Sediment Sources	Current Estimated Load (Tons/Year)	Total Allowable Load (Tons/Year)	Sediment Load Allocation (Percent Reduction)
Background Sediment (natural)	7,246		N/A (Natural)
Forest Roads	1,570	911*	42%
Timber Harvest	617		0%
Fires of 2000	50,642		N/A (Natural)
Eroding banks (human-caused)	No estimate given		75%

***NOTE**: These numbers come from the Bitterroot headwaters TMDL, published in 2005, Table 4-20, page 172; thus, information is not presented in the same format here as the other priority streams in this WRP. No allocation was given for timber harvest because the TMDL states these activities are typically short-lived and can be mitigated with BMPs.*

** Calculated based on the called-for reduction of 659 tons/year.*

2014–2019: Because BRWF began implementing restoration projects on the East Fork Bitterroot River in 2011, sediment reductions are expected. Projects conducted under this WRP will include WEPP or NRCS modeling, or a similar project comparison model, to analyze and estimate potential sediment load reductions in tons/year. This data will then be submitted to DEQ in a format compatible with the MT-eWQX database.

5.2 – RYE CREEK

Sediment Sources	Current Estimated Load (Tons/Year)	Total Allowable Load (Tons/Year)	Sediment Load Allocation (Percent Reduction)
Roads	64	24	63%
Eroding banks(human-caused)	621	379	13%
Eroding banks (natural)	1,314	1,314	
Upland Erosion	10	7	33%
Point Source	0	0*	0%
Total Sediment Load	**2,009**	**1,724**	**14%**

Note: These numbers come from the Bitterroot Mainstem TMDLs, Table 5-66, Page 5-59.

** This allocation represents the maximum allowable load under the constraints of the current Stormwater Construction permit.*

2014–2019: Because BRWF began implementing restoration projects on Rye Creek in 2011, sediment reductions are expected. Projects conducted under this WRP will include WEPP or NRCS modeling, or a similar project comparison model, to analyze and estimate potential sediment load reductions in tons/year. This data will then be submitted to DEQ in a format compatible with the MT-eWQX database.

5.3 – CAMERON CREEK

Cameron Creek does not have TMDLs for sediment.

2014–2019: BRWF intends to plant additional native vegetation on Cameron Creek to supplement plantings that were completed in 2013. These plantings will likely contribute to a reduction in overall stream temperatures but not within a 5-year time frame since they will need time to grow large enough to provide stream shade.

5.4 – THREEMILE CREEK

Sediment Sources	Current Estimated Load (Tons/Year)	Total Allowable Load (Tons/Year)	Sediment Load Allocation (Percent Reduction)
Roads	22	7	67%
Eroding banks(human-caused)	2,288	1,098	35%
Eroding banks(natural)	1,082	1,082	
Upland Erosion	1,384	836	40%
Point Source	0	11*	0%

Sediment Sources	Current Estimated Load (Tons/Year)	Total Allowable Load (Tons/Year)	Sediment Load Allocation (Percent Reduction)
Total Sediment Load	**4,776**	**3,034**	**36%**

Note: These numbers come from the Bitterroot Mainstem TMDLs, Table 5-69, Page 5-60.

** This allocation represents the maximum allowable load under the constraints of the current Stormwater Construction permit. Full compliance with all conditions of the permit should achieve a load less than the amount given in this table.*

2014–2019: Because BRWF began implementing restoration projects on Threemile Creek in 2012, and the Clark Fork Coalition has completed restoration projects in the area since TMDLs were developed, sediment load reductions are expected. Projects conducted under this WRP will include WEPP or NRCS modeling, or a similar project comparison model, to analyze and estimate potential sediment load reductions in tons/year. This data will then be submitted to DEQ in a format compatible with the MT-eWQX database.

5.5 – SLEEPING CHILD CREEK

Sediment Sources	Current Estimated Load (Tons/Year)	Total Allowable Load (Tons/Year)	Sediment Load Allocation (Percent Reduction)
Roads	31	11	63%
Eroding Banks(human-caused)	885	593	12%
Eroding Banks(natural)	1,502	1,502	
Upland Erosion (all land uses)	243	197	19%
Point Source (stormwater construction)	0	3*	0%
Total Sediment Load	**2,661**	**2,306**	**13%**

Note: These numbers come from the Bitterroot Mainstem TMDLs, Table 5-6, Page 5-59.
** This allocation represents the maximum allowable load under the constraints of the current Stormwater Construction permit. Full compliance with all conditions of the permit should achieve a load less than the amount given in this table.*

2014–2019: Based on time constraints and capacity limitations, BRWF does not expect to work on sediment reduction in Sleeping Child Creek prior to 2019.

5.6 – BURNT FORK CREEK

Sediment Sources	Current Estimated Load (Tons/Year)	Total Allowable Load (Tons/Year)	Sediment Load Allocation (Percent Reduction)
Roads	21	8	62%
Eroding Banks(human-caused)	2,070	952	41%
Eroding Banks(natural)	656	656	
Upland Erosion (all land uses)	2,279	1,195	48%
Point Source (stormwater construction)	0	19*	0%
Total Sediment Load	**5,026**	**2,830**	**44%**

Note: These numbers come from the Bitterroot Mainstem TMDLs, Table 5-65, Page 5-59.

** This allocation represents the maximum allowable load under the constraints of the current Stormwater Construction permit. Full compliance with all conditions of the permit should achieve a load less than the amount given in this table.*

2014–2019: Based on time constraints and capacity limitations, BRWF does not expect to work on sediment reduction in Sleeping Child Creek prior to 2019. However, Trout Unlimited completed a large-scale revegetation and fencing project on Burnt Fork in 2012 and is working with various groups and agencies on private and public lands to improve water quality and fish habitat. Future projects conducted under this WRP will include WEPP or NRCS modeling, or a similar project comparison model, to analyze and estimate potential sediment load reductions in tons/year. This data will then be submitted to DEQ in a format compatible with the MT-eWQX database.

5.7 – SKALKAHO CREEK

Skalkaho Creek does not have TMDLs for sediment.

5-Year Time Frame: Based on time constraints and capacity limitations, BRWF does not expect to work on sediment reduction in Sleeping Child Creek prior to 2019.

**Note: When TMDLs were developed in the Bitterroot watershed, DEQ took care to include potential disturbances from construction sites that may affect sediment contributions within subwatersheds by including the caveat: "This allocation represents the maximum allowable load under the constraints of the current Stormwater Construction permit." Stormwater construction permits are point-source sediment permits required for construction sites. The sites are mainly theoretical (i.e., not currently being disturbed but could be if a permit is awarded); however, construction could eventually take place, so in the TMDL, DEQ incorporated the potential for sediment contribution. The numbers reflect mitigations and BMPs being applied and also assumes that only a portion of the potential sites would be disturbed at any one time.*

SECTION 6.0 – Implementation Assistance (EPA Element #4)

6.1 - TECHNICAL ASSISTANCE

While BRWF does not have staff scientists or an official technical advisory committee, we do have an active Projects Committee and local partners who provide technical assistance and guidance as needed during project selection, development, implementation, and monitoring. We will routinely request technical assistance from the appropriate state agencies and regional scientists, which will likely include participation from:

- FWP: Chris Clancy, Fisheries Biologist; Hamilton, MT
- BNF: Ed Snook and Marilyn Wildey, Hydrologists; Cole Mayn, Soil Scientist; and Soil, Water, Fisheries, and Heritage Staff; Hamilton, MT
- Department of Natural Resources Conservation Service: Matt Whithed, District Conservationist; Hamilton, MT
- DEQ: Laura Andersen, Water Quality Specialist; Helena, MT
- Bitterroot Conservation District: Julie Ralston, Administrator; Tom Ruffato, Chair; Hamilton, MT

6.2 - FINANCIAL ASSISTANCE

Because each management measure or restoration project will generally call for a different funding approach, we expect to use a wide range of funding sources to implement this WRP. Table 6.2 includes a partial list of potential funding sources.

TABLE 6.2 POTENTIAL FUNDING FOR PROJECT IMPLEMENTATION

Potential Funder	Types of Projects Funded	Timeline
Montana Department of Environmental Quality (DEQ) Section 319 Program	Address nonpoint source pollution and implement TMDLs	Final applications due in October; funding available in July
Soil and Water Conservation Districts of Montana Inc. (SWCDMI) Mini-grants	Education and Outreach	Spring and Fall
Montana FWP Future Fisheries Improvement Program	Projects that benefit fish	December and June
U.S. Forest Service (USFS) 1. USFS Partnership Grant 2. RAC	1. Projects that benefit local resources on Forest Service land 2. Projects that protect/enhance water resources; education, trails, and roads projects.	1. Ongoing 2. Annually
National Fish and Wildlife Foundation: 5 Star and Urban Waters Restoration Program	Develop community capacity to sustain local natural resources for future generations	February

Potential Funder	Types of Projects Funded	Timeline
Montana Department of Natural Resources and Conservation (DNRC) 1.Watershed Planning Assistance Grant Program 2. Renewable Resource Grant and Loan Program	1. Watershed planning for Conservation Districts 2. Conservation, management, development and preservation of renewable resources	1. August, November, February 2.May 15 (even numbered years)

SECTION 7.0 –EDUCATION AND OUTREACH (EPA Element #5)

Having an informed and involved watershed community is one of the best ways to achieve success in watershed restoration efforts. Projects and progress cannot be achieved without support from local landowners, which includes a level of understanding and trust for the organization that is proposing and implementing restoration projects. This notion extends beyond people who own waterfront properties on which potential projects exist, and requires support from local community members via volunteerism and financial contributions. In recent years, BRWF has shifted focus to educate youth, providing opportunities for young people to partake in educational activities and restoration projects as a way to engage and inspire future stewards of our water resources.

TABLE 7.0 TOOLS AND PROGRAMS TO ENSURE INVOLVEMENT AND SUPPORT OF RESTORATION EFFORTS

Tool	Action	Timeline	Cost
Website	Conveys watershed information to the public. We are upgrading to include all watershed group information and current activities.	Ongoing	$100/month will include website fees and staff time to update
Newsletter	Sent to landowners and donors to inform them about current activities and proposed projects, and includes interesting news relevant to the restoration efforts.	Twice Annually	$2/person x number of individuals on BRWF mailing list plus development time ($35/hour)
Watershed Display	Set up at community events to showcase past and current projects.	Ongoing/When opportunities are available	$35/hour, usually 2-8 hours
Bitterroot Conservation District Updates	Updates on current projects as well as requests for ideas for future projects.	Monthly	$35/hour, 4-6 hours per month
Watershed Tours	To showcase completed projects and highlight areas where work still needs to be done to improve the overall health of the watershed.	Annually	$50/hour; tour averages 5 hours; development time averages 10 hours
Annual Meeting	Public meeting to showcase completed projects and receive input on future needs.	Annually	$500

Tool	Action	Timeline	Cost
Field Trips	Educational trips for local students to highlight water usage and management needs.	One to two times per year	$1,200
Riverfest in the “Root”	Annual festival offering educational opportunities for local youth and their families and drawing attention to BRWF’s efforts in the watershed.	Annually in August	$2,750-$3,500
Earth Stewardship Program	Local partnership with seven schools connecting natural resource professionals and students in exploring local resource issues.	Each school year	$7,500

SECTION 8.0 –MONITORING (EPA Element #9)

Monitoring and evaluation plans will measure progress, assess maintenance needs, and track project successes and failures. BRWF's Projects Committee will develop project-specific monitoring plans and explore potential data gaps in monitoring for individual projects. We will determine which stakeholder organizations are responsible for specific monitoring components and what needs to be done in the planning phases to ensure successful monitoring. Adaptive management—being aware of changing conditions and addressing them as better information becomes available—will allow us to improve the process, prioritize projects, and revise the WRP over time.

TABLE 8.0. TYPES OF MONITORING AVAILABLE TO ENSURE PROJECT SUCCESS

Parameter	Monitoring Method	Responsible Party	Costs
Water Temperature	• USGS Gaging Stations • MT FWP Temperature Loggers • University of Montana graduate student temperature collection data	• USGS • FWP • BRWF will coordinate with students	• Free to BRWF • Free to BRWF • Free to BRWF
Vegetation	• Photopoint[1] • Plant community composition	• BRWF • BRWF	• $50/hour • $50/hour
Sediment	• PIBO[2] • Pebble counts • WEPP: Roads Modeling[3]	• USFS • DEQ • BRWF	• Free to BRWF • Free to BRWF • $35/hour
Education	• Metrics tracking number of people reached at events, presentations, forums, etc. • Metrics tracking number of publications distributed	• BRWF • BRWF	• $35/hour • $35/hour

1. Photo Point Monitoring:

   Representative photos will be used to show changes at a project site resulting from a specific habitat restoration activity, such as riparian planting and/or fencing. A combination of photos from different vantage points will be taken to highlight overall conditions. These photos will be updated periodically to demonstrate changes at the site and gauge the effectiveness of restoration methods overtime.

   Photos will also be used as needed to document events or incidents that may require action (e.g., damage to a site caused by high water events or fire) or to highlight a specific sample point within a project area.

2. PACFISH/INFISH Biological Opinion Effectiveness Monitoring Program (PIBO) Method:

   PIBO monitoring is an effectiveness monitoring program with varied types of monitoring, including vegetation analysis, aquatic invasive inventorying, and in-stream monitoring, to determine changing aquatic conditions.

3. Water Erosion Prediction Project (WEPP): Roads Modeling

   The WEPP model for roads is designed to predict runoff and sediment yield from roads, compacted landing and skid trails, and compacted foot, cattle, or off-road vehicle trails. WEPP: Road modeling allows the user to specify the characteristics of

the road by climate, addition of soil or gravel, road design and surface condition, ditch condition, and local topography. WEPP: Roads modeling is used to calculate erosion and deposition to estimate the annual amount of sediment leaving the road.

SECTION 9.0 – CRITERIA FOR DETERMINING SUCCESS (EPA Element #8)

TABLE 9.0. ACTIONS AND MILESTONES TO DETERMINE EFFECTIVENESS

Objectives & Actions	Measurable Milestones/Outputs
Increase local access to watershed education through outreach at events and retention of contact information	Increased attendance at BRWF programs and events by 10%. Increased BRWF newsletter and e-updates recipients by 10% annually. Increased annual donations by 15%.
Increase local participation and engagement in restoration activities	Increased number of participants in local restoration activities, including revegetation projects and the River Clean Up. Increased numbers of individuals receiving the BRWF newsletter and updates (10%).
Trend of decreased water temperature over 10-year period	Trend to lower water temperature by 1-3 degrees Celsius.
Positive riparian vegetation growth	75% or higher survival rate of native plantings
Trend of decreased sediment loading over 10-year period on streams where management measures are successfully implemented.	Water quality monitoring data indicates a negative trend in sedimentation by 5% in 5 years and 10% in 10 years.
Review WRP priorities and actions to determine success	Compile and analyze project data to determine whether trends are improving in 5 years. Revise WRP in 2019.

SECTION 10.0 - REFERENCES

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APPENDIX A: GLOSSARY OF TERMS AND ABBREVIATIONS

Alluvial: relating to, composed of or found in alluvium.

Alluvium: clay, silt, sand, or gravel deposited by running water

Anthropogenic: caused or produced by humans

Belt Series: major division of late Precambrian rocks in North America

BMP: "Best Management Practices" are measures taken to reduce water pollution. For example, installing a silt fence during construction is a BMP to reduce sediment transported to a water body (river, lake, stream, ocean).

BNF: Bitterroot National Forest,

Confluence: The meeting of two or more bodies of water.

CFC: Clark Fork Coalition, a nonprofit that works to protect and restore water quality throughout the Clark Fork River basin.

DEQ: the "Montana Department of Environmental Quality" (www.deq.mt.gov) is a government agency in the executive branch state of Montana with a mission to protect, sustain, and improve a clean and healthful environment to benefit present and future generations.

DNRC: The "Montana Department of Natural Resources and Conservation" provides leadership in the management of state's natural resources and promotes stewardship of Montana's water, soil, forest, and rangeland resources.

EPA: The "United States Environmental Protection Agency" (www.epa.gov) is an agency of the U.S. government created for the purpose of protecting human health and the environment.

FWP: Montana "Fish, Wildlife & Parks" (http://fwp.mt.gov/) is a government agency in the wildlife, and state-owned park resources in Montana for the purpose of providing recreational activities.

Glaciated: an area that is or has been covered in glaciers or ice sheets.

Load reductions: A decrease in the amount of pollution released.

Metamorphosis: rocks formed by heat and pressure causing physical or chemical change.

Metasedimentary: sedimentary rock altered by metamorphosis.

Nitrogen: is a common chemical element required by living organisms. Too much nitrogen in streams can cause excessive algal growth.

Nonpoint Source (NPS) Pollution: pollution from diffuse sources, as opposed to "Point Source Pollution" that comes from a single, identifiable source.

Nutrient: A nutrient is a substance that an organism needs to live and grow. Common nutrients considered in stream ecosystems include nitrogen, phosphorous, and carbon.

NRCS: the "Natural Resource Conservation Service" (www.nrcs.usda.gov) formerly known as the Soil Conservation Service (SCS), is an agency of the United States Department of Agriculture (USDA) that provides technical assistance to farmers and other private landowners and managers.

Phosphorous: is a common chemical element required by living organisms. Too much phosphorous in streams can cause excessive algal growth.

RAC: a "Resource Advisory Committee" is a committee developed as part of the Secure Rural Schools Act, which decides on local community collaboration with federal land managers in recommending Title II projects on federal lands or that will benefit resources on federal lands.

Restoration: the return of a landscape, ecosystem, or other ecological entity to a predefined historical state.

Riparian: is the interface between land and a river or stream.

Sediment loading: sediment transported by a water body.

Silviculture: the growing and cultivation of trees

TMDL: A "Total Maximum Daily Load" is a regulatory term in the U.S. Clean Water Act, describing the maximum amount of a pollutant that a body of water can receive while still meeting water quality standards.

TU: Trout Unlimited, a nonprofit that works to protect critical habitat, to reconnect degraded waterways, and restore populations to coldwater fisheries.

Subbasin Plan: Bitterroot Subbasin Plan for Fish and Wildlife Conservation, a basin-wide plan identifying biological objectives and strategies to protect, mitigate, and enhance fish and wildlife populations within the Bitterroot watershed.

Substrate: Earthly material that exists on the bottom of a riverbed, often dirt, rocks, sand, or gravel.

Tributaries: a stream or river that flows into a larger water body (river, lake, stream, ocean).

USGS: The "United States Geological Survey" (www.usgs.gov) is a scientific agency of the United States government. The scientists of the USGS study the landscape of the United States, its natural resources, and the natural hazards that threaten it.

Watershed: All of the land which drains precipitation in the form of rain or snow to a specific point.

Wetlands: A wetland is an area of the landscape that is inundated or saturated by surface or groundwater and supports vegetation adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas.