Big Hole River, Montana
Watershed Restoration Plan

Part I: Upper & North Fork Big Hole Watershed

Produced by:
Big Hole Watershed Committee

November 1, 2012

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Produced with Funds and Support from:

Montana Department of Environmental Quality 319 Program

Helena, Montana

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Acronyms

BDNF	Beaverhead Deer Lodge National Forest
BHWC	Big Hole Watershed Committee
BLM	Bureau of Land Management
CCAA	Candidate Conservation Agreement with Assurances
DEQ	Montana Department of Environmental Quality
EPA	Environmental Protection Agency
ESA	Endangered Species Act
MFWP	Montana Fish, Wildlife and Parks
TMDL	Total Maximum Daily Load
USFS	United States Forest Service (Beaverhead Deer Lodge National Forest)
USFWS	US Fish & Wildlife Service

Project Area

The Big Hole River watershed is located in southwest Montana (outlined in red). The colored areas within the watershed represent public lands and the white areas represent private lands. The Big Hole River headwaters begin in the south-west corner of the watershed and flow north, then east, to its confluence with the Beaverhead River near Twin Bridges. There are two watershed restoration plans at work in the Big Hole River watershed. The black line shows the division between two watershed restoration plans:

Part I: Upper & North Fork Big Hole River Watershed Restoration Plan (this document)

Part II: Middle & Lower Big Hole River Watershed Restoration Plan (separate document)

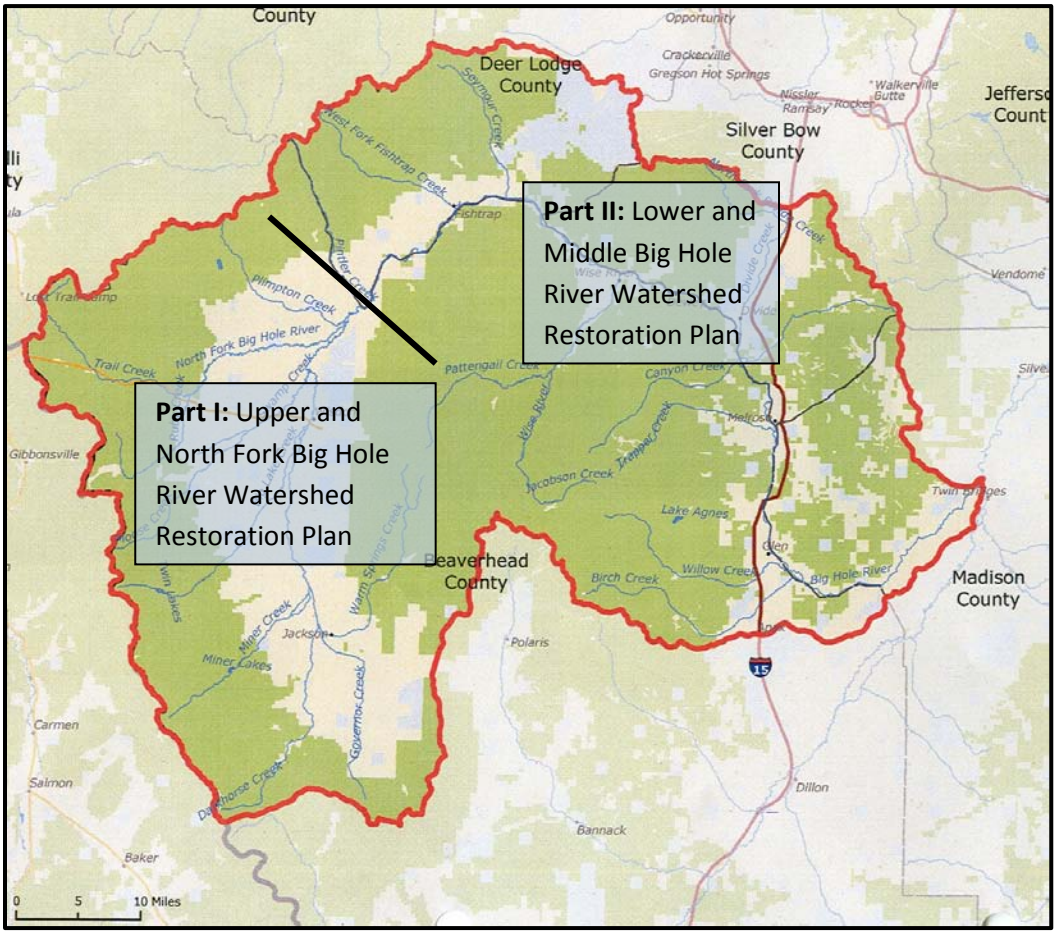


Figure 1: Big Hole River Watershed, Montana

Executive Summary

The Watershed Restoration Plan is a coordinated document that outlines restoration in terms of impacts, goals, objectives, and measures of improvement. The plan serves to coordinate efforts in restoration among stakeholders.

The Upper Big Hole watershed is unique in that there are four active watershed restoration plans in place and those plans cover the majority of area in the Upper Big Hole watershed. The four plans are the US Forest Service (USFS) Forest Plan, the Bureau of Land Management's (BLM) Watershed Assessment, the Upper Big Hole Candidate Conservation Agreement with Assurances (CCAA) program, and the Montana Fish, Wildlife and Parks Statewide Fisheries Management Plan (see Figure 2).

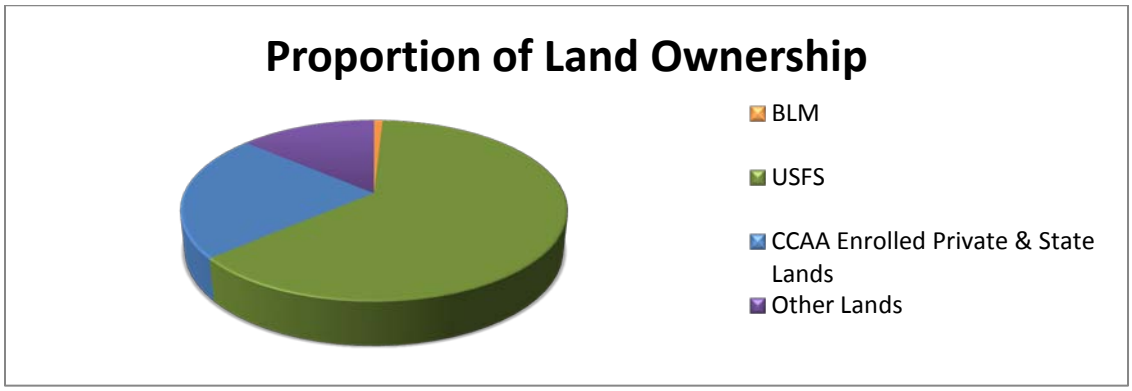
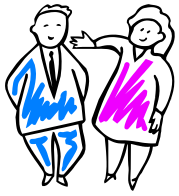


Figure 2: Proportion of land ownership in the Upper Hole watershed managed under existing watershed restoration plans.

The primary water quality issues of concern in the Upper Big Hole watershed are high water temperature and high sediment loads, often attributed to low flows due to drought and irrigation withdrawals and the lack of riparian vegetation and the channel changes that occur as a result of riparian vegetation loss. Yet improvement in water temperature and sediment issues are difficult to track given that changes occur over years or decades and varies with natural changes in precipitation and air temperature. In some cases high nutrients and high metals may also be a water quality issue, but typically on a local scale.

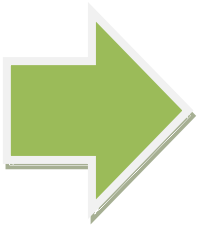
While each watershed plan has different goals, the restoration activities associated with those goals often benefit or could benefit water quality with little extra cost or effort.

The Upper Big Hole and North Fork Big Hole TMDL was completed in 2009 (Montana DEQ, June 2009). Significant effort towards watershed restoration has occurred since the information for the TMDL was collected in 2004.



It is important to focus on lands interested in making improvements in water quality and to continue to implement projects that will decrease water temperature and increase stream flows. This occurs through riparian vegetation, grazing management, irrigation infrastructure upgrades, and wetlands restoration.

Purpose



This Watershed Restoration Plan was compiled by the Big Hole Watershed Committee (BHWC). The BHWC serves as a coordination hub and communication group between interests in the Big Hole Valley, including private land owners, residents, agencies, conservation groups, sportsman, outfitters.

The goal of this plan is to provide a coordinated approach to restoration in the Big Hole. The Upper Big Hole Valley is unique in that there are several active restoration plans underway simultaneously. Therefore, it was unnecessary and in fact and duplication of effort, to create a watershed restoration plan independent of existing plans.

The existing plans have varied goals, such as to improve the fishery, forest health, or range production. However, the activities used to achieve those goals also have a positive effect on water quality. Alternatively, it may be cost effective to add water quality benefit to an activity as a secondary goal for minimal cost.

The BHWC determined the best approach to Upper Big Hole watershed restoration was to

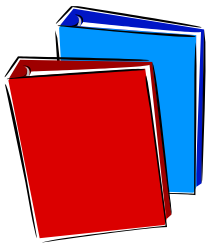
1. Compile the existing efforts into one concise resource (this plan)

2. Coordinate efforts among interests and encourage communication.

3. Support planned activity, either with in-kind, implementation, financial, or other support

4. Advocate to add water quality benefit for planned projects.

Watershed Restoration Planning



A Watershed Restoration Plan is a guiding document that outlines watershed restoration goals and needs to address non-point source pollution. The plan describes actions to occur over a 3-5 year period. It is designed to be a working document that is reviewed and updated as needed. The goals and needs outlined will help watershed groups and stakeholders clearly meet objectives and coordinate efforts between stakeholders.

The Big Hole River watershed is divided into two sections - the Upper & North Fork Big Hole River and Middle & Lower Big Hole River. There is a watershed restoration plan for each section. The plans were developed with support from Montana Department of Environmental Quality 319 program.

The Environmental Protection Agency (EPA) developed a protocol for Watershed Restoration Plan development. Each Watershed Restoration Plan should contain the 9 minimum elements:

1. Identification of causes of impairment
2. An estimate of the load reductions expected from management measures
3. A description of the nonpoint source management measures that will need to be implemented to achieve load reductions
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
5. An information and education component 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
6. Schedule for implementing the nonpoint source management measures identified in this plan that is reasonably expeditious
7. A description of interim measurable milestones for determining whether nonpoint source management measures or other control actions are being implemented
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
9. A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established

The Big Hole Watershed Committee

The Big Hole Watershed Committee (BHWC), established 1995, seeks common ground among diverse viewpoints for watershed restoration and preservation in the Big Hole River watershed.

Mission: *"To seek understanding of the Big Hole River and agreement among individuals and groups with diverse viewpoints on water use and management in the Big Hole watershed."*

The BHWC operates within four focus areas, each with a priority initiative:

1. Land Use Planning: Climate resiliency, specifically riparian protection standards and incentives for landowners to preserve riparian systems.

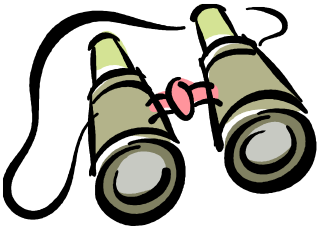
2. Wildlife: Reduce predator-human conflict with non-lethal deterrence

3. Water Quality & Quantity: Gain climate resiliency, specifically in water scarcity & high water temperature. Actions are through management plans, monitoring, research, and restoration activities. This includes the use of wetlands as a tool to improve or maintain water quality.

4. Invasive Species: Reduce and prevent invasive species infestation, particularly noxious weeds.

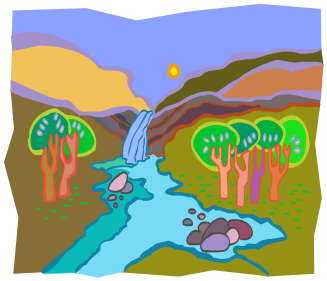
More information is available on our website: **bhwc.org**

Vision



The Upper Big Hole watershed hosts fully functioning aquatic ecosystems and supports and sustains a viable ranching economy. Biological populations and water quality are monitored closely. The watershed is resilient to drought and other climate pattern changes. Plans are in place to adjust human activities during drought to sustain aquatic systems. Its residents are invested in watershed health. Provisions are in place to protect sensitive areas of the watershed in perpetuity. Efforts to improve or project the watershed are coordinated among interest groups.

Watershed Characterization



The Upper Big Hole River watershed is a high elevation valley. The landscape is rural. The valley bottom is primarily private lands used for cattle ranching and hay production sustained by flood irrigation. The uplands are primarily public lands, managed by either USFS or BLM, or State of Montana. Public lands are often leased by ranches for cattle grazing. The Anaconda-Pintler Wilderness is located at the most downstream portion of the watershed. A National Battlefield, the Big Hole Battlefield, is located west of Wisdom. Population is sparse with a total population less than 600 residents (Census 2010). There are two towns, Wisdom and Jackson. The Big Hole River headwaters begin near the town of Jackson at the Continental Divide and is a headwater tributary to the Missouri River. See **Table 1** for details and **Table 2** for subwatersheds.

Attention has been directed towards this watershed as it is home to the Arctic grayling, a fish that faced significant decline in the 1970-1980's and a candidate for endangered species listing. Significant focus has been placed on actions and plans to recover the species over the last two decades.

Table 1: Watershed Characterization

Description	**Headwaters to Pintler Creek-Big Hole River Confluence**
Miles of Big Hole River	~40 miles
Watershed Area	770,761 acres
Counties	Beaverhead, Deer Lodge
Population (Census 2010)	<600
Land Ownership	Total Acres: 770,761 USFS Acres: 475,823 Private Acres: 288,638 BLM Acres: 6300 State Acres: 5645 National Battlefield Acres: 655 CCAA Enrolled Private and State Lands Acres: 141,940
Species of Special Concern Fish:	Westslope Cutthroat Trout, Yellowstone Trout, Arctic Grayling (candidate for ESA)
High Priority Abandoned Hard Rock Mine Sites (DEQ)	Ajax (Swamp Creek headwaters) - Gold Trail Creek (Ruby Creek headwaters) - Gold & Silver Wisdom (headwaters of Steele, Doolittle, McVay (McVey), Sane, Sheep Creeks & Fox Gulch) - Gold & Silver

Table 2: Sub-watersheds, 303d listed streams, and their impairment sources. See Table 11 for details. See Figure 3 for map. See page 62 for sub-watershed summaries.

Sub-Watershed	303d (2012)	Impairment Categories
Governor Creek	Governor Creek Pine Creek Fox Creek	Physical habitat alterations related to agriculture and habitat alterations.
Warm Springs Creek	Warm Springs Creek	Nutrients & physical habitat alterations related to agriculture and habitat alterations.
Big Hole River Headwaters	none	Physical habitat alterations related to agriculture and silviculture/roads.
Big Hole River Wisdom	Rock Creek Swamp Creek Steele Creek	Nutrients & physical habitat alterations related to agriculture and other alterations.
North Fork Big Hole River	Joseph Creek Tie Creek Johnson Creek Schultz Creek Mussigbrod Creek	Physical habitat alterations related to mining operations, agriculture, silviculture/roads, and other alterations.
Big Hole River Squaw Creek	McVey Creek Pintler Creek	Physical habitat alterations, nutrients, and water issues related to agriculture and Other Alterations.

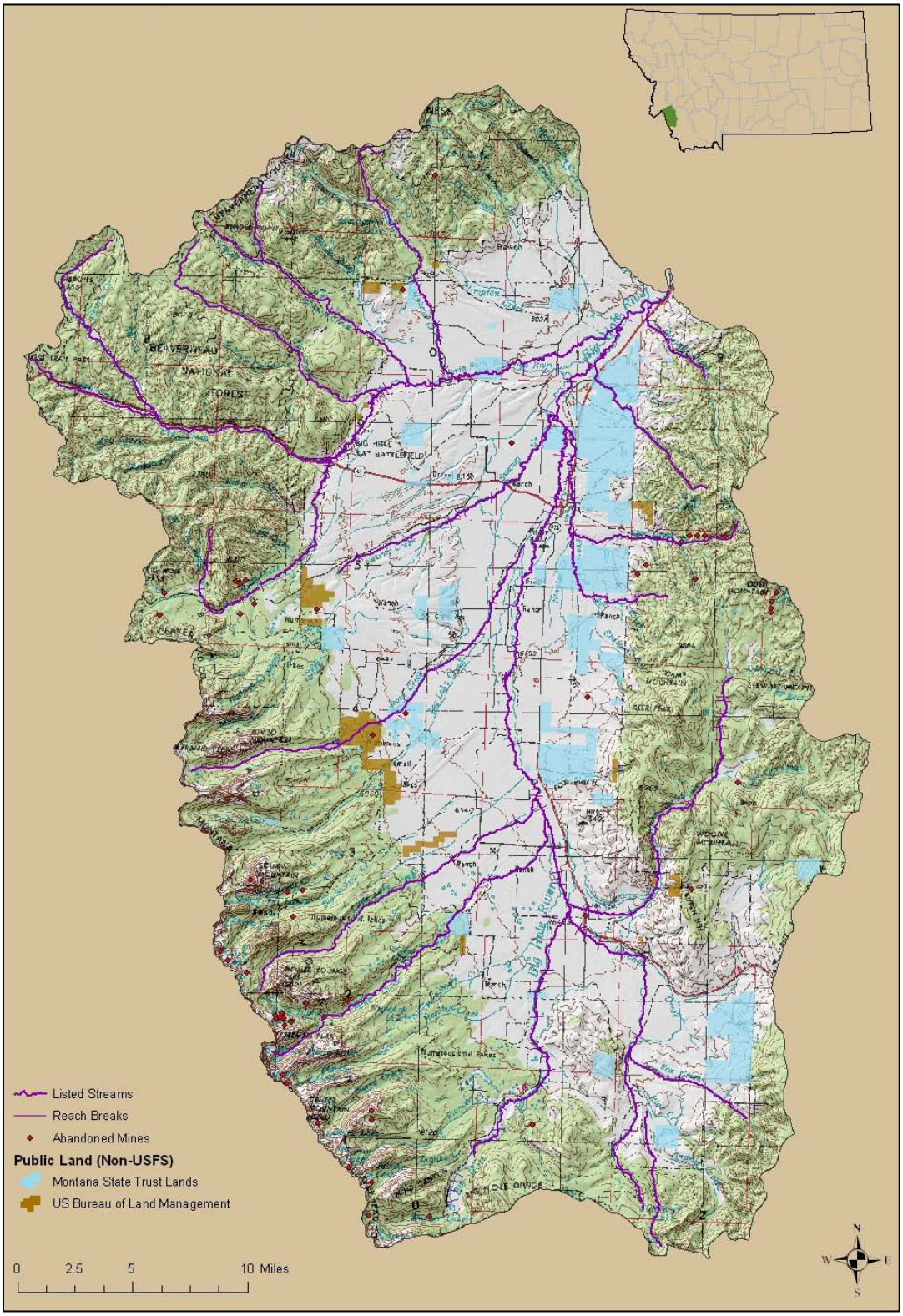
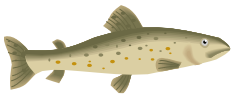


Figure 3: Map of 303d listed streams, abandoned mines, streams and land cover in the Upper Big Hole River Watershed. Map Source: (Montana DEQ, June 2009) - Appendix K.

Sensitive Species



There are 11 Montana Fish, Wildlife and Parks Species of Concern in the Upper Big Hole watershed.

The Fluvial Arctic Grayling and the CCAA Program

Montana FWP: Species of Special Concern
USFWS: Candidate for Endangered Species Listing
USFS: Sensitive Species
BLM: Sensitive Species

The Fluvial Arctic grayling (*Thymallus arcticus*) is a member of the trout family. The Big Hole River is the last remaining native population in the lower 48 states. They spawn in the spring and their diet is largely made up of aquatic insects. While the grayling can be found throughout the Big Hole River drainage, the majority of the population resides in the Upper Big Hole. Therefore, much of the restoration effort and future needs are driven by the habitat needs of the Arctic grayling. The grayling require cold and clear waters. They are typically a small fish with a identifiable large, iridescent dorsal fin. (Montana Field Guide)

Candidate Conservation Agreement with Assurances (CCAA) Program: In the upper Big Hole, the BHWC is a partner in an ambitious conservation and restoration initiative known as the Candidate Conservation Agreement with Assurances or CCAA. The Big Hole CCAA is the largest of its kind ever attempted in the United States. Bringing together local, state, and federal agencies, private landowners, non-profit organizations and many other parties, the CCAA develops restoration projects targeted to the last remaining population of fluvial Arctic grayling in the lower 48 states. Montana Fish, Wildlife & Parks (FWP) and US Fish & Wildlife Service (USFWS) determined that the most immediate human-influenced threats to fluvial Arctic grayling in the Big Hole River are habitat loss, degradation, and fragmentation. *The CCAA proposes to remediate those threats by addressing the following four issues: reduced streamflows; degraded and non-functioning riparian habitats; barriers to fish migration; and entrainment in ditches.* The agencies "have developed a phased implementation schedule to provide immediate and long-term benefits to grayling, facilitate maximum landowner participation, and enable development of meaningful site-specific plans that are tailored to (each) property," including a monitoring plan. (Montana Fish, Wildlife and Parks and the U.S. Fish and Wildlife Service, 2006)

Legal Status of Fluvial Arctic Grayling: On April 24, 2007 the USFWS determined that the grayling population in the upper Missouri River basin was no longer warranted for listing under the ESA. This determination removed grayling from the Candidate Species List. Grayling remain a "Species of Special Concern" in Montana. On November 15, 2007 a lawsuit was filed by the Center for Biological Diversity, the Grayling Restoration Alliance, the Federation of Flyfishers and the Western Watersheds Project to overturn the USFWS decision not to list the grayling population in the upper Missouri River basin as either Threatened or Endangered. In the settlement agreement, the Service agreed to publish a new status review finding on or before August 30, 2010. As part of the settlement, the Service agreed to

consider the appropriateness of a Distinct Population Segment (DPS) designation for Arctic grayling populations in the upper Missouri River basin. Since the 2007 finding, additional research has been conducted and new information on the genetics of Arctic grayling has become available. As a result, on September 8, 2010, the Service determined that listing the upper Missouri River basin as a DPS of Arctic grayling, as threatened or endangered under the Endangered Species Act is warranted, but that listing the fish is precluded at this time by the need to complete other listing actions of a higher priority. In 2011, the Center for Biological Diversity reached an agreement with the USFWS to move forward on listing decisions on 757 species, including the Arctic grayling. Under the settlement, a final listing proposal is due in 2014. (Montana Fish, Wildlife and Parks, 2012)

Westslope Cutthroat Trout

Montana Fish, Wildlife and Parks: Species of Special Concern
USFWS: NA
USFS: Sensitive
BLM: Sensitive

The Westslope Cutthroat Trout (*Oncorhynchus clarkii lewisi)* is one of two cutthroat trout species in Montana. The cutthroat is the Montana state fish. The fish is identified by red throat slashes and black spots on the body. The cutthroat population is significantly reduced, now occupying less than 3% of its original range. The decline is attributed to hybridization and competition from non-native trout and from habitat degradation. The cutthroat trout requires cool waters with little sediment. They spawn in the spring leaving their eggs in redds made in the gravels. Westslope cutthroat trout restoration is active in the Big Hole watershed. Primarily, populations are guarded by a natural or manmade barrier and freed of non-native fish in order to thrive. (Montana Field Guide)

Lake Trout

Montana Fish, Wildlife and Parks: Species of Concern
USFWS: N/A
USFS: N/A
BLM: N/A

A small native population of Lake Trout (*Salvelinus namaycush)* reside in a small lake in the Upper Big Hole watershed. The Lake Trout resides in deep, cold lakes and spawn each fall by broadcasting their eggs onto the lake bottom. They feed on aquatic insects and other fish. The population in this lake is native and a remnant of glacial movement with this small population became stranded. (Montana Field Guide)

Western Toad

Montana Fish, Wildlife and Parks: Species of Concern
USFWS: N/A
USFS: Sensitive
BLM: Sensitive

The Western Toad (*Bufo Boreas*) is, with one rare exception, the only toad species in western Montana. The Western Toad may occupy a wide range of habitat types including wetlands, dry conifer forest and aspen stands, streams, and wet meadows. The toad reproduces in the spring. Their eggs and larvae require shallow, still water for survival through the summer. The toad eats live insects. Specialists recommend the following actions to benefit toads in their known breeding sites: Reduce grazing and avoid pesticide use in and near, avoid stocking predatory game fish if not already present, and remove toads prior to use lethal stream treatments on the fishery. (Montana Field Guide)

Western Pearlshell Mussel

Montana Fish, Wildlife and Parks: Species of Concern
USFWS: N/A
USFS: Sensitive
BLM: N/A

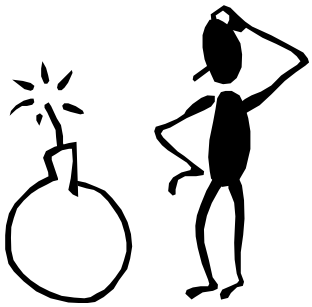
The Western Pearlshell (*Margaritifera falcata*) is the only mussel to live in Montana's coldwater streams in habitats that typically also house westslope cutthroat trout. Their typical size range is between 50-80mm long. Threats to this species includes impoundments, siltation, eutrophication (resulting from high nutrients). (Montana Field Guide)

Table 3: Other sensitive species (Montana Field Guide)

Species	Habitat
Brachylagus idahoensis Pygmy Rabbit	Sagebrush
Lepus californicus Black-tailed Jack Rabbit	Sagebrush Grassland
Perognathus parvus Great Basin Pocket Mouse	Mixed Conifer Forest
Spilogale gracilis Western Spotted Skunk	Sagebrush Grassland
Synaptomys borealis Northern Bog Lemming	Riparian Shrub
Boloria frigga Frigga Fritillary - Butterfly	Montane Wetlands
Euphydryas gillettii Gillette's Checkerspot - Butterfly	Wet Meadows

- *For More Information:* **Montana Field Guide Online - FWP**

Section I: What is the Problem?
Causes of Impairment in the Upper Big Hole Watershed



Non-point source impairments to water quality in the Upper Big Hole watershed include high water temperature, sediment, nutrients and metals (Table 4). Factors that contribute to water quality impairments are largely human caused due to agricultural (grazing and hay production) and forest land practices (roads and timber harvest); however weather patterns and natural causes also are a contributing factor. Impairments in the Upper Big Hole River can largely be attributed to a loss of riparian vegetation.

Table 4: Water quality impairments, causes, and remedies in the Big Hole River watershed. See Table 5 for detailed impairments by sub watershed and stream. Source: (Montana DEQ, June 2009)

Water Quality Impairment	**Cause of Impairment**	**Remedy**
Temperature	Lack of riparian vegetation for shade Low summer time stream flow Widened channel	Restore Riparian Vegetation to: 1 Provide shade 2. Reduce width-to-depth ratios 3. Absorb nutrients 4. Reduce bank erosion 5. Prevent additional sediment inputs 6. To catch sediment before reaching the stream. Improve Irrigation Efficiency Prevent sediment from washing into streams from roads. Use wetlands as a means to attain water quality
Nutrients	Natural sources Upland grazing runoff Streambank erosion Fertilizer use Animal feeding operations	
Sediment	Eroding banks (81%) Uplands (Silviculture, grazing, natural) (17%) Erosion off unpaved roads (2%)	
Other Watershed Issues	**Cause of Issue**	**Remedy**
Arctic grayling population	High water temperature Low stream flows Entrainment in ditches	Riparian vegetation restoration to decrease water temperature Improve irrigation efficiency Provide fish passage or exclusion

Section II. Who Determines Water Quality Issues?

This section identifies key players in the Big Hole River watershed that work under plans that ultimately improve water quality:

- Montana Department of Environmental Quality (DEQ)
- US Forest Service: Beaverhead Deer Lodge National Forest (USFS)
- Bureau of Land Management (BLM)
- CCAA/US Fish and Wildlife Service
- Montana Fish, Wildlife and Parks (MFWP)
- Big Hole Watershed Committee (BHWC)

Each plan has unique goals, work areas, and action plans. This section provides a summary of each plan and reference to each plan. This watershed restoration plan incorporated the goals and actions identified in these plans in order to create a coordinated approach to watershed restoration.

Water Quality: Montana Department of Environmental Quality

The TMDL & the 303(d) List:

The Upper and North Fork Big Hole River Planning Area TMDLs (Total Maximum Daily Loads) and Framework was finalized in 2009 (Montana DEQ, June 2009). This report summarized non-point source water quality impairments, targets for restoration, and guidelines for restoration for the mainstem North Fork Big Hole River and several tributaries. A non-point source pollutant cannot be tied to a single source as the source is widespread. In contrast, a point source pollutant can be tied to single location or source. A summary of the impairments listed in the TMDL are provided in **Table 5**.

Every two years, DEQ publishes the 303(d) list. Streams found on this list are not meeting one or more beneficial uses for water quality. There are four beneficial uses: 1. Drinking Water, 2. Aquatic Life, 3. Agriculture, 4. Recreation. The intention of the 303(d) list is to provide a list of impaired waters in which TMDLs need to be developed. A list of 303d listed streams in the Upper Big Hole watershed is provided in **Table 17.** Links to these resources are also provided:

- **303d lists on CWAIC**
- **Upper and North Fork Big Hole River Planning area TMDL and Framework**

Table 5: Summary of Upper Big Hole watershed impairments and their sources as stated in the TMDL (Montana DEQ, June 2009)

Impairments	Source
Temperature	1. Lack of streamside vegetation (Shade) 2. Wide and shallow channels
Sediment	1. Eroding banks 2. Unpaved roads 3. Placer mining Potential: Culverts
Nutrients	1. Agriculture
Metals	1. Localized mining remnants

The TMDL produced for the Upper Big Hole developed targets that can be used to assess progress towards meeting water quality goals. The targets are described in detail in the TMDL document in Chapter 4 (DEQ, 2009). The following four impairments and the measures used in the targets are described in **Table 6.**

Table 6: TMDL Target Summary

Impairment	Target Measures
Temperature	Maximum Temperature Channel Width-Depth Ratio Canopy Density Measured Over the Stream Understory Shrub Cover along Green Line Instream Flow Irrigation Return Flow
Sediment	Channel Width-Depth Ration Understory Shrub Cover along Green Line Pool Frequency Percent Fines Human Caused Sources Macroinvertebrate Assessment Eroding Banks
Nutrients	Total Nitrogen Total Phosphorous Chlorophyll a *the following are for non-conifer zones:* Percent Shrubs along Green Line Percent Shrubs along Line Transects Percent Bar Ground
Metals	Cadmium Copper Mercury Zinc Lead

USFS Beaverhead - Deer Lodge Forest Plan

The US Forest Service Beaverhead-Deer Lodge National Forest (BDNF) adopted a Forest Plan in 2009 (US Forest Service, 2009). The plan covers the entire forest of 3.38 million acres, of which the Upper Big Hole watershed is a part. The BDNF manages for four forest services and commodities: recreation, timber, grazing, and leasable minerals. Within the plan, BDNF addresses several natural resource and forest condition goals, objectives and standards (listed in Table 7). A link to the plan is provided:

- **Beaverhead Deer Lodge National Forest Plan**

Table 7: USFS Beaverhead Deer Lodge National Forest Plan - Resource Categories. Each category lists goals, objectives and standards. (US Forest Service, 2009)

Resource Categories - Chapter 3 of Forest Plan
Forest Wide
Air Quality
American Indian Rights & Interests
Aquatic Resources
Economic & Social Values
Fire Management
Heritage Resources
Infrastructure
Lands
Livestock Grazing
Minerals, Oil, Gas
Recreation & Travel Management
Scenic Resources
Soils
Special Designations
Timber Management
Vegetation
Wildlife Habitat

The plan outlines a move by the USFS to manage lands with an aquatics focus. New additions include the installation of a 300 foot buffer on each side of the stream to protect riparian zones, project work must not have a negative impact on aquatic resource without mitigation in key watersheds, and the creation of key watersheds for either 1) Fish, representing the highest quality watersheds, and 2) Restoration, representing the most impacted watersheds that are in need of restoration. As part of the plan, grazing plans are being reviewed to update grazing management and travel management is under review to address roads and road maintenance. (US Forest Service, 2009). Appendix H of the Forest Plan outlines the key watersheds. The Upper Big Hole key watersheds are provided in Table 8 and Figure 4.

Table 8: USFS Beaverhead Deerlodge National Forest Key watersheds in the Upper Big Hole watershed. (US Forest Service, 2009)

Key Watershed	Resource Emphasis
Andrus Creek	Fish
Fox Creek	Fish
Plimpton Creek	Fish
Doolittle Creek	Fish
Squaw Creek-Pioneers	Fish
Saginaw Creek	Restoration
Moosehorn Creek	Restoration

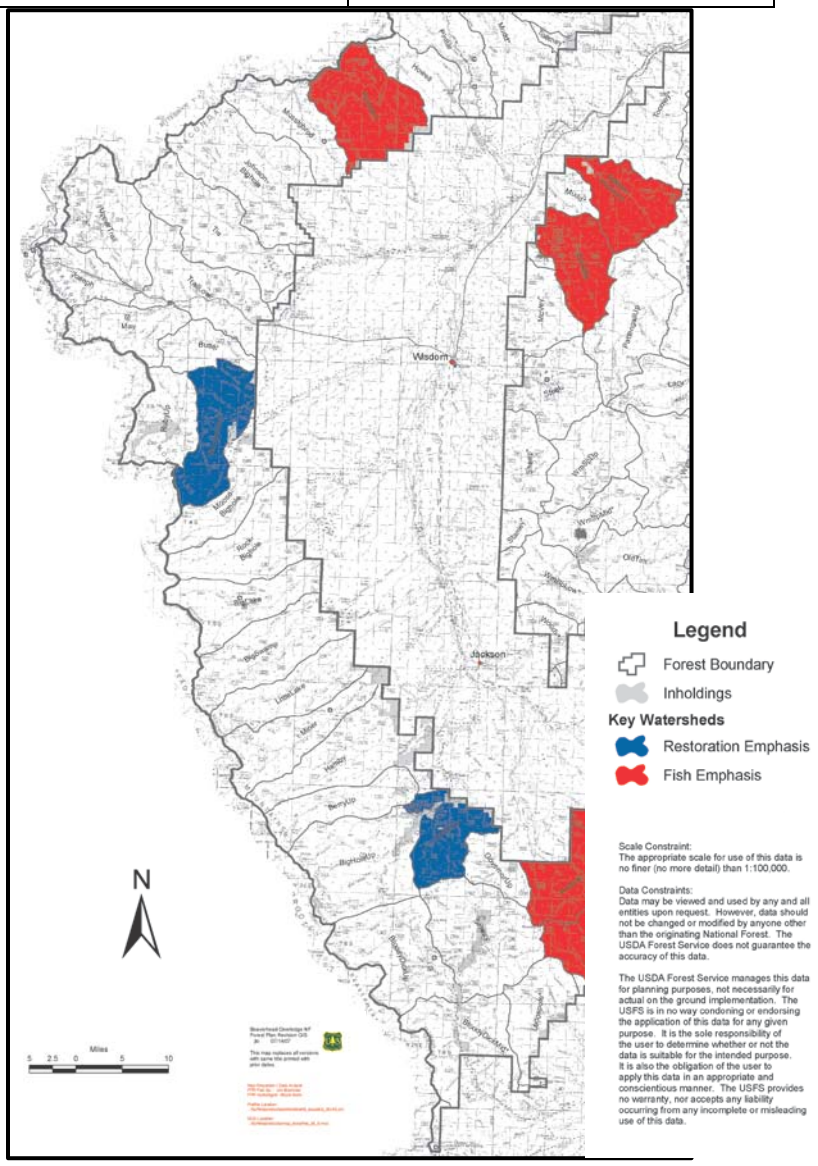


Figure 4: USFS Beaverhead Deerlodge National Forest Plan - Key watersheds. Note: This map is cropped from its original size to show only the Upper Big Hole watershed. (US Forest Service, 2009)

The Forest Plan defines the area for the Upper Big Hole in the "Management Area Direction: Big Hole Landscape."

The USFS Forest Plan specifically addresses water quality and the TMDL as "Total Maximum Daily Loads (TMDLs): Management actions are consistent with TMDLs. Where waters are listed as impaired and TMDLs and Water Quality Restoration Plans are not yet established, management actions do not further degrade waters. Water quality restoration supports beneficial uses." (US Forest Service, 2009)

The USFS also manages the Anaconda-Pintler Wilderness. The wilderness area is 158,516 acres and contains the headwaters of streams originating in the north-eastern portion of the Upper Big Hole watershed, including Mussigbrod Creek and Pintler Creek. Motorized travel is not allowed in the wilderness.

USFS Strategy

The USFS Beaverhead Deerlodge National Forest Plan outlines specific goals, objectives and standards for forest management in each category, one of which is Aquatic Resources, as "Chapter 3: Forestwide Direction." This chapter, and specifically the Aquatic Resources portion, details specific plans for how the USFS intends to meet water quality and other aquatic resources needs. Additional criteria are applied to the key watersheds described in section 1 of this document, a minimum of which is no negative ecological response in fish key watersheds. The objectives of the Aquatic Resources section is provided here, beginning on page 13 of the Forest Plan

- **Chapter 3: Forestwide Direction**

The following is direct excerpt from the Forest Plan. Use the link above to see the entire document.

Objectives

Vegetation Management: Manage vegetation to reduce the risk of adverse wildfire impacts to isolated native fish populations and water resources at the sub-watershed scale (6th Code HUC).

TMDLs: Cooperate with the state, tribal, and other agencies and organizations to develop and implement Total Maximum Daily Loads (TMDLs) and their implementation plans for 303(d) impaired water bodies influenced by National Forest System lands.

Watershed Analysis: Prepare and maintain a schedule for completing watershed analysis, with emphasis on key watersheds shown on page 58, or listed in Appendix H (IN).

Management Indicator Species: Maintain habitat conditions for native species as reflected by changes in abundance of *Drunella doddsi* (Mayfly) as a Management Indicator Species (MIS).

Restoration Key Watersheds: Complete watershed assessments for restoration key watersheds and associated restoration activities.

Spawning Areas: Reduce impacts from grazing practices in known or suspected threatened, endangered or sensitive fish spawning areas to avoid or reduce trampling of redds that may result in adverse impacts to threatened or endangered species, loss of viability, or a trend toward federal listing of sensitive species **(**GM 4**).**

Riparian Management Objectives: Establish stream specific Riparian Management Objectives (RMOs) using watershed or other analyses incorporating data from streams at or near desired function. RMOs

are a means to define properly functioning streams and measure habitat attributes against desired condition. The following RMOs apply by stream reach until new RMOs are developed through watershed or other site specific analysis,

(West of the Continental Divide) *(not included in this document)*

(East of the Continental Divide)

- Entrenchment Ratio (all systems) Rosgen Channel: A - <1.4, B – 1.6 – 1.8, C - >10.3, E ->7.5.
- Width/Depth Ratio (all systems) Rosgen Channel: A - <11.3, B – <15.8, C - <28.7, E -<6.9.
- Sediment Particle size, % < 6.25mm (all systems) Stream Type: B3 - <12, B4 - <28, C3 - <14, C4 - <22, E3 - <26, E4 - <28.
- Large Woody Debris: (forested systems) >20 pieces per mile, > 6 inch diameter, >12 foot length.
- Bank Stability: (nonforested systems) >80% stable.

Wildland Fire Management: Suppression activities are designed and implemented so as not to prevent attainment of desired stream function, and to minimize disturbance of riparian ground cover and vegetation. Strategies recognize the role of fire in ecosystem function and identify those instances where fire suppression actions could perpetuate or damage long-term ecosystem function or native fish and sensitive aquatic species (FM 1**).**

Temporary Fire Facilities: Incident bases, camps, helibases, staging areas, helispots and other centers for incident activities are located outside of RCAs. An interdisciplinary team, including a fishery biologist, is used to predetermine incident base and helibase location during pre-suppression planning (FM 2**).**

Fire Suppression: Chemical retardant, foam, or additives are not delivered to surface waters. Guidelines (fire management plan) are developed to identify exceptions in situations where overriding safety or social imperatives exist (FM 3**).**

Mineral Inspection: Mineral activities are inspected and monitored. The results of inspections and monitoring are evaluated and applied to modify mineral plans, leases, or permits as needed to eliminate impacts that prevent attainment of desired stream function and avoid adverse affects on threatened and endangered aquatic species and adverse impacts to sensitive aquatic species (MM 6**).**

Road Drainage: Reconstruct road and drainage features that do not meet design criteria or operation and maintenance standards, or are proven less effective than designed for controlling sediment delivery, or retard attainment of desired stream function, or increase sedimentation in Fish or Restoration Key Watersheds (RF 3a**).**

Roads: Close and stabilize or obliterate and stabilize roads not needed for future management activities (RF 3c**).**

Recreation Sites: Existing, new, dispersed, or developed recreation sites and trails in RCAs are adjusted if they retard or prevent attainment of desired stream function, or adversely affect threatened or endangered species or adversely impact sensitive species. Adjustments may include education, use limitations, traffic control devices, increased maintenance, and relocation of facilities (RM 1)**.**

Bull Trout Restoration: Prioritize bull trout restoration activities with consideration given to bull trout core areas population status and health. Coordination will occur with USFWS, other federal, state, and local agencies.

End excerpt from USFS Forest Plan, Chapter 3

Bureau of Land Management - Upper Big Hole Watershed Assessment

- **BLM Upper Big Hole Watershed Assessment**

The Bureau of Land Management Dillon Field Office recently completed an Upper Big Hole Watershed Assessment. Field data was collected in 2009. BLM lands within the Upper Big Hole watershed were assessed for riparian/wetlands, air, water quality, and uplands condition. The report includes existing conditions, recommendations for improvement, and a monitoring plan. The BLM reviewed five unalloted tracts and 12 allotments including near 6300 acres, or less than 1% of the lands in the Upper Big Hole watershed. **Figure 5** shows BLM allotments assessed in the report and **Table 9** describes the conditions under the BLM watershed goals. The assessments for riparian and wetland condition and water quality were the most relevant for this report.

The following segments are summaries or direct excerpts from the BLM Upper Big Hole Watershed Assessment. They are portions of the assessment most relevant to this report. The full report is available through the link provided above or from the BLM directly.

Riparian Condition: The riparian assessment found that 52% of riparian areas were of an acceptable condition, while the remaining 48% of riparian areas were impaired to some degree. Impairment causes were primarily due to channel degradation resulting in lost access to the floodplain. Invasive plants were present in impaired reaches. Impairments were also caused by irrigation diversion systems, many of which whose age caused problems in identifying stream channel versus irrigation ditch.

Wetland Condition: Of the wetlands found within BLM lands, 29% (256 acres) are in acceptable condition. In contrast, 71% of the wetlands found within BLM lands are impaired to some degree and 1% were considered "non-functional." The cause for wetland degradation was "altered subsurface flow patterns and excessive hummock formation." Beaver activity was not common and may also play in role in the drying of wetlands.

Swamp Creek was noted as having a high level of degradation. In 1984, a 100 acre burn used to restore vegetation was not followed with appropriate grazing controls. As a result, the burn attracted heavy grazing pressure from livestock and wildlife.

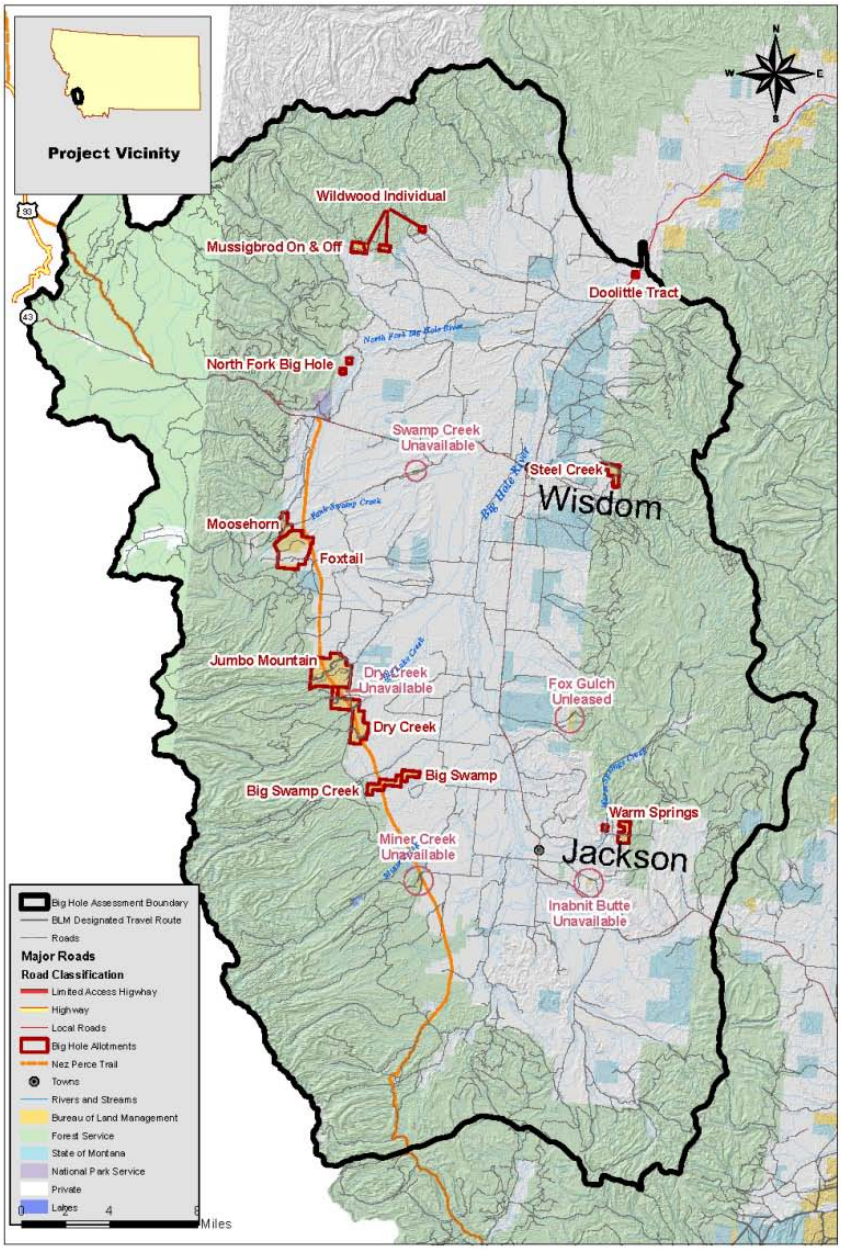
Water Quality: The BLM recognizes and works directly with Montana DEQ in meeting the goals outlined in the TMDL for the Upper Big Hole and North Fork Big Hole (DEQ, 2009). The BLM notes use of AMP's and BMP's on BLM lands to "restore or maintain" water quality.

The following are recommendations made by the BLM in their assessment for improvement in riparian and wetland condition (direct quote):

Additional recommendations to specifically address water quality:

1. Continue working with Montana DEQ and local watershed committees in the development and implementation of water quality restoration plans.

2. Continue to implement and evaluate Best Management Practices to address NPS pollution and make adjustments as necessary.
3. Continue to share Watershed Assessment findings with DEQ.
4. Revise AMPs to mitigate riparian and upland resource concerns. In addressing these concerns, nonpoint source pollution will be addressed. (Specific allotments are noted in the Upland and Riparian Health sections.)



Map 1 - Big Hole Assessment Area - Vicinity Map and Allotments

Figure 5: Bureau of Land Management map of lands assessed in the Upper Big Hole watershed (U.S. Bureau of Land Management, 2009)

Table 9: Land Health Summary by BLM Management Unit - from BLM Upper Big Hole Watershed Assessment Executive Summary page 2 (U.S. Bureau of Land Management, 2009)

Allotment Name & Number	Are Rangeland Health Standards Being Met?					Significant Factors in Failing to Achieve Standards
	Uplands	Riparian Areas & Wetlands	Water Quality	Air Quality	Providing Habitat	
Big Swamp #10141	n/h	NO	1	YES	NO	Existing grazing management; Reduced beaver activity, Irrigation diversions; Historic drainage ditches
Big Swamp Creek #20715	n/h	NO	1	YES	NO	Existing grazing management; Reduced beaver activity, Irrigation diversions; Historic drainage ditches
Doolittle Tracts #20196	YES	YES	No[2]	YES	YES	Big Hole River, BLM management not a factor
Dry Creek #20104	YES	YES	1	YES	YES[3]	None
Foxtail #30616	YES	YES	1	YES	YES[3]	None
Jumbo Mountain #20721	YES	YES	No[2]	YES	YES[3]	Rock Creek, BLM management not a factor
Moose Horn #00142	YES	YES	1	YES	YES[3]	None
Mussigbrod On & Off #20705	YES	NO	1	YES	NO	Existing grazing management
North Fork Big Hole #10742	YES	NO	No[2]	YES	NO[3]	Existing grazing management; Irrigation diversions; Historic drainage ditches
Steel Creek #10743	YES	NO	1	YES	YES[3]	Existing grazing management
Warm Springs #20596	YES	NO	No[2]	YES	NO[3]	Existing grazing management; Reduced beaver activity; Non-native species
Wildwood Individual #30250	YES	YES	1	YES	YES[3]	None
Unallotted Parcels						
Fox Gulch - Unleased	YES	YES	1	YES	YES[3]	None
Swamp Creek - Unavailable	NO	NO	1	YES	NO	Existing grazing management; Irrigation diversions; Noxious weeds
Dry Creek - Unavailable	YES	n/h	n/a	YES	YES[3]	None
Miner Creek - Unavailable	YES	n/h	n/a	YES	YES[3]	None
Inabnit Butte - Unavailable	YES	n/h	n/a	YES	YES	None

n/h - Negligible or no habitat present in management unit
n/a - Not applicable
[1] Tributary streams in the UBHW are not on the 303(d) list, are not priority streams, and are not scheduled to be evaluated by the DEQ.
[2] The Montana Department of Environmental Quality (DEQ) has the responsibility for making water quality determinations and has completed its evaluation of 303(d)-listed streams. Upper Big Hole River, North Fork of Big Hole River, Rock Creek and Warm Springs Creek flow through BLM administered land, have been evaluated by Montana Department of Environmental Quality (DEQ) and beneficial use support determinations have been completed.
[3] Forest Heath Concerns noted, see Assessment Report.

BLM Strategy

The following information is a direct excerpt from the BLM Watershed Assessment (U.S. Bureau of Land Management, 2009) *and outlines objectives for BLM land restoration that pertain to improving water quality:*

Riparian, Wetland, and Aquatic Habitat and Associated Species

Objectives

Restore stream dimension, pattern and profile to the natural range of variation, as measured by the width/depth ratio of stream channels appropriate to stream type.

Maintain or increase deep-rooted riparian vegetation (sedges, willows) along the greenline.

Reduce sediment loads where uses on public lands are causing increased sediment (e.g. cattle loitering, road maintenance, etc).

Increase wetland and facultative vegetation within wetlands, seeps and springs.

Enhance habitat for cold water fisheries in occupied streams within the watershed. Seek opportunities to work cooperatively with adjacent landowners to divert water back into natural channels.

Monitoring Activities to measure progress towards meeting Riparian, Wetland, and Aquatic Habitat and Associated Species objectives:

Continue monitoring westslope cutthroat trout population and distribution in coordination with Montana Fish, Wildlife and Parks (MFWP).

Continue monitoring existing riparian studies to measure progress towards site specific objectives and PFC.

CCAA Program

The Candidate Conservation Agreement with Assurances (CCAA) program assesses and identifies impairments for restoration on lands enrolled in the CCAA program (Figure 6). Each land is assessed individually and the results of the assessment are largely confidential. Each land is required to follow guidelines for restoration and for meeting milestones in order to be part of the program. Program staff review lands for riparian condition, irrigation infrastructure condition, noxious weed infestation, and so on. More information is available in the CCAA plan and can be accessed using the following link:

- **Candidate Conservation Agreement with Assurances for Fluvial Arctic Grayling in the Upper Big Hole River**

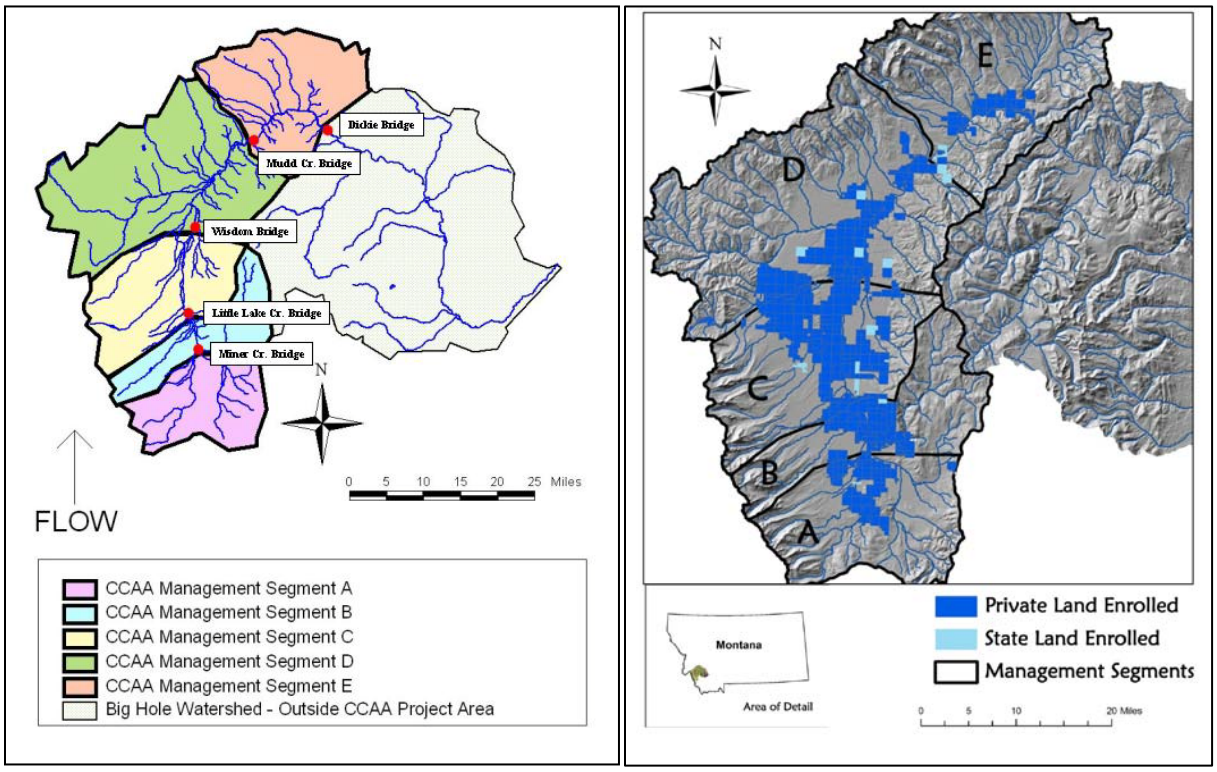


Figure 6: Left: CCAA Management Sections. Right: Area of state and private land enrolled into the Big Hole Grayling CCAA Program since August 1, 2006.

The CCAA program implements strategies and reviews progress to improve the Arctic grayling fishery through six mechanisms:

I. Fisheries Population Monitoring
II. Entrainment Surveys
III. Instream Flow Monitoring
IV. Instream Temperature Monitoring
V. Channel Morphology Measurements
VI. Riparian Health Monitoring

The strategies are in place to achieve three goals:

1. Improve riparian and channel function - Includes channel restoration, riparian fencing, willow planting, stockwater systems, grazing management plans, weed control.

2. Improve instream flows - Include communication, education, hydrological monitoring network, flow/drought management plans, improved infrastructure, programmatic effort.

3. Provide connectivity to important life-history habitats - includes improving stream flows, improve channel function, remove barriers - i.e. fish ladders, culvert replacements, minimize/eliminate entrainment.

The overarching goals of the program are two positive indicators:

1. Numbers of Arctic grayling show a positive population trend.

2. Arctic grayling occupy historic habitat.

CCAA Strategy

The CCAA program works towards five positive indicators. Progress towards these goals are measured and reviewed annually and every 5 years (Montana Fish, Wildlife and Parks and the U.S. Fish and Wildlife Service, 2006):

- Improve riparian and channel function - Measure: Sustainable Riparian Areas in 15 Years
- Improve instream flows - Measure: Meet established flow targets
- Provide connectivity to important life-history habitats - Measure: Increased fish distribution/use
- There will be and continue to be a positive trend in Arctic grayling numbers
- Arctic grayling will occupy historic habitats within 10 years of CCAA start (2006)

Montana Fish, Wildlife and Parks

Montana Fish, Wildlife and Parks (MFWP) prioritizes fisheries management work statewide under a Statewide Fisheries Management Plan. The plan was reviewed in 2012 and in draft form at the time of this report. Follow the link below to view the entire plan:

Montana Fish, Wildlife and Parks Statewide Fisheries Management Plan

The plan contains priorities by species and location for the entire Big Hole watershed. Portions of the plan that apply to the Upper & North Fork Big Hole portions of the watershed are provided in Table 10.

Table 10: Montana Fish, Wildlife and Parks Statewide Fisheries Management Plan priorities Big Hole Watershed. The table includes priorities that apply to the Upper and North Fork Big Hole River watershed. The contents of this table are a direct copy from the statewide plan. Reference the entire plan for more information. (Montana Fish, Wildlife and Parks, 2012) *** denotes priorities that apply to the entire Big Hole watershed**

Water	Miles/ Acres	Species	Origin	Management Type	Management Direction
Big Hole River and Tributaries - Headwaters to Dickey Bridge	93 miles	Arctic grayling, Lake trout, Mountain whitefish, Burbot, Westslope cutthroat trout Brook trout, Rainbow trout, Brown trout, Hybridized cutthroat trout	Wild Wild	Conservation General/ Special Regulations	Continue native species conservation to maintain a viable, self-sustaining population Continue to manage to minimize potential impact on viability of Arctic grayling and secondarily for recreational angling
Habitat needs and activities: Continue to improve stream flows, improve riparian habitats, improve stream channel form and function, continue to prevent fish entrainment into irrigation ditches.					
*Mountain Lakes		Westslope cutthroat trout, Hybridized cutthroat trout, Yellowstone cutthroat trout, Rainbow trout, Brook trout, Golden trout	Wild	Put- Take/ General	Monitor mountain lakes. Continue to manage stocking and harvest to maintain present numbers and sizes. Consider increasing angler harvest to reduce numbers if necessary to maintain fish growth. Where appropriate pursue opportunities to expand golden trout into mountain lakes where such management would not conflict with cutthroat conservation.
*Cutthroat Conservation Streams	350 miles	Westslope cutthroat trout and other native fish species	Wild/ Transport	Conservation	Secure populations in tributary streams by removing non-native fish upstream of fish barriers and restoring westslope cutthroat trout.
Habitat needs and activities: Work with Forest Service, BLM and DRNC and private landowners on grazing regimes to minimize livestock impacts to streams. Work on water conservation projects to improve stream flows. Construct or utilize natural fish barriers to preclude non-native fish movement upstream. Remove non-native fish and restore WCT upstream.					

Big Hole Watershed Committee

The BHWC does not have watershed assessments or irrigation infrastructure surveys completed for the Upper Big Hole watershed. The BHWC follows the lead of the CCAA program and supports the surveys and restoration activities the CCAA program develops.

The BHWC met with its board members, residents, landowners, agencies, counties and conservation groups to determine the top priorities and methods for watershed restoration planning. The results are consolidated and provided in **Figure 7**.

Figure 7: BHWC Watershed Restoration Planning Goals and Methods

The BHWC implements the goals and methods through four categories:

- Land Use Planning
- Wildlife
- Weeds/Invasive Species
- Water Quality/Quantity

BHWC Strategy

The BHWC is a strong supporter of the restoration in the Upper Big Hole watershed. The BHWC will measure success by:

1. Support and participation or partnership with Upper Big Hole restoration efforts. This includes continued close contact with agency employees, private landowners, and other stakeholders and continued fiscal support of restoration efforts.

2. Work with private landowners outside of the CCAA program on restoration goals when applicable.

3. Advocate the use the wetlands and wetland restoration as an important watershed restoration tool to improve water quality.

3. Support installation of functioning headgates, water measurement, fish passage of every irrigation withdrawal point in the Upper Big Hole watershed. In addition, BHWC supports the use of stockwater tanks to reduce late season irrigation withdrawals and supports the reconfiguration of irrigation systems for overall water savings to maintain instream flows. The BHWC recognizes that increased stream flows are critical to the health of the entire watershed.

4. Engagement and Education: The BHWC role in the restoration is to provide opportunities and encourage participation from stakeholders in activities, learning, listening and education on restoration activities. The BHWC will work to continue and increase support and engagement the restoration. Methods include monthly meetings with presentations, invitations to agencies to present progress and needs, information and announcements posted on website, social media, e-mail and newsletters, host public events called "tours" to view completed work, and more. This is measured by:

- Attendance at BHWC monthly meetings
- Number of social media members
- Number of members and/or annual donations
- Attendance at BHWC "tours" or other public events.
- Participation in BHWC Drought Management Plan

Section III: What Should the Watershed Look Like?
Water Quality Goals & Priorities

Blended Watershed Restoration Goals

There are several working watershed restoration plans in the Upper Big Hole watershed. Each varies by location, lead agency or group, and goals. However, many of the actions described in these plans ultimately benefit water quality. Since these plans work in unison in the Upper Big Hole watershed and are summarized in Section II.

In order to fully reach watershed restoration water quality potential in a timely and cost effective manner and to leverage expertise and resources most effectively, it is important to blend watershed restoration goals from the several watershed restoration plans that are in use (see Section II) into one meaningful summary under the guise of water quality as in Table 11. Despite varied goals, restoration falls into the similar pattern.

Table 11: Blended watershed restoration priorities from state, federal, and local groups

Watershed Restoration Goal Category	Watershed Restoration
Water Temperature	• Improve water temperature, especially during July - September
Stream Flow	• Improve stream flows, especially during July - September
Sediment	• Reduce sediment inputs
Nutrients	• Reduce nutrient inputs
Fish & Wildlife	• Conduct activities that will improve fish and wildlife population, diversity, and native species. • Prevent the decline of species considered threatened or endangered. • Support coexistence with predator species and reduce human-predator conflict. • Reduce the spread of wildlife-cattle diseases.
Weeds/Invasive Species	• Prevent the spread of noxious weeds and invasive species already present. Prevent the introduction of new noxious weeds and invasive species.
Regulatory Protections	• Support existing regulatory protections. • Advocate and support the development and implementation of new regulatory protections. • Advocate for the insertion of watershed protections wherever possible into revision or development processes.

The top priorities are:

- Repair damaged riparian zones
- Improve irrigation infrastructure, add water measurement and fish passage devices.
- Take all measures possible to improve stream flows and water temperatures. This includes the use of wetlands, voluntary irrigation reductions, etc.
- Protect completed restoration and protect lands in good condition.
- Protect the river corridor with land use planning.
- Promote collaboration among stakeholders

The top priority regions are:

- Section C & D of the CCAA
- USFS Restoration Watersheds Saginaw and Moosehorn
- BLM Allotments in the North Fork Big Hole watershed and the Big Hole Wisdom watershed.
- Stream reaches identified as having sparse or moderate riparian vegetation density (**Figure 8)**

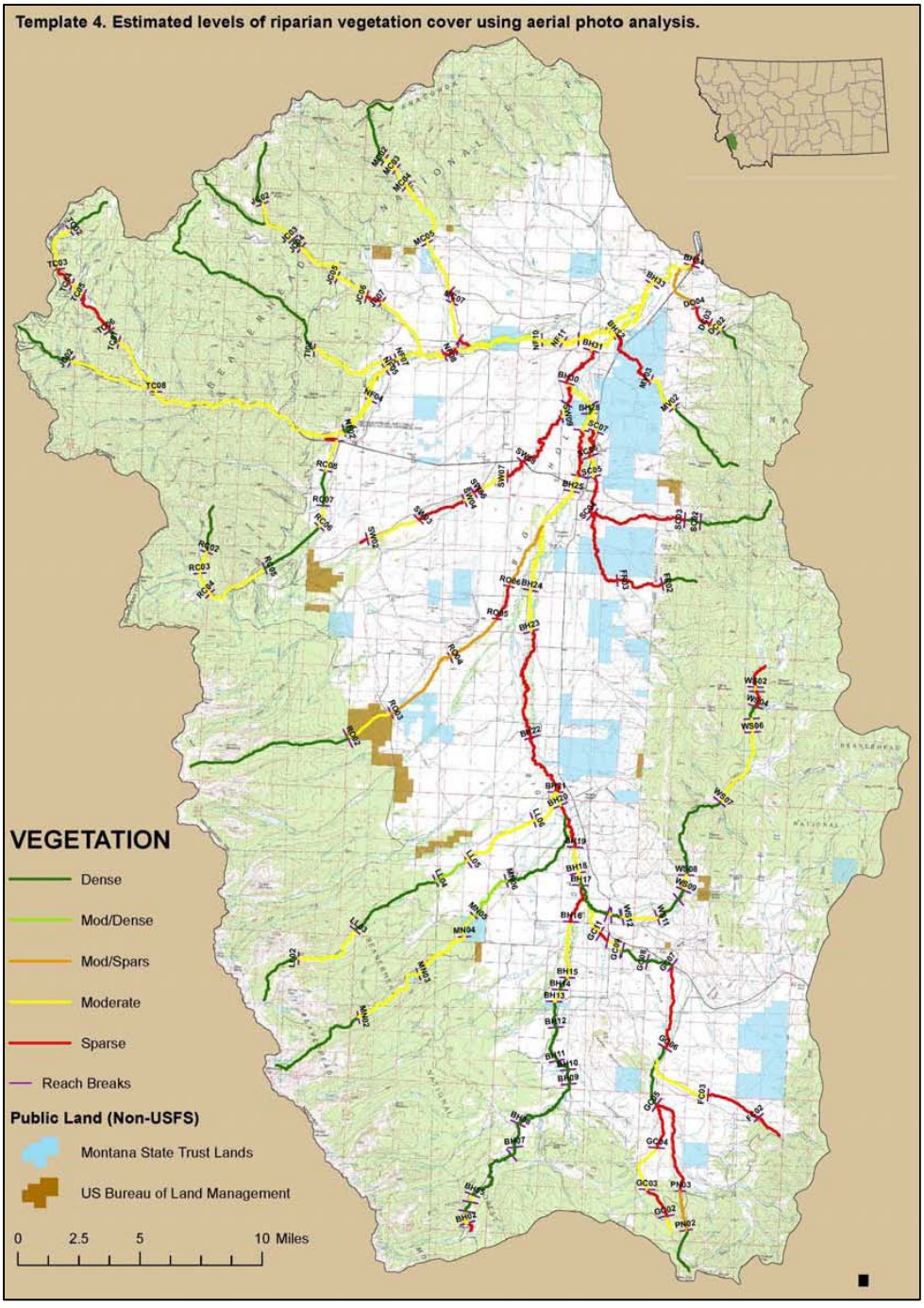


Figure 8: Upper Big Hole riparian vegetation cover density. Source: (Montana DEQ, June 2009) - Appendix K

Riparian restoration goals can be further broken down into objectives. Each restoration objective can be tied to a reduction in load causing the water quality impairment or the resolution of a water quality or natural resource issue. These improvements are based on estimates and represent a best guess as to potential watershed improvement as a result of an activity. **Table 12** lists watershed restoration goals, objectives, potential load reductions and the source of the provided information.

Table 12: Restoration goals and associated potential load reductions.

Remedy	Restoration Goal	Load Allocation Associated with:	Source
Riparian Restoration	On the Big Hole River mainstem, increase the median canopy density measured over the stream from 14% to >= 43%	121% increase in canopy density (Table 7-2, TMDL)	DEQ TMDL (Table 7-2)
	On tributary streams in the Big Hole River valley bottom, increase median canopy density measured over the stream from 49% to >= 63%	28% increase in canopy density	DEQ TMDL (Table 7-2)
	On tributary streams in the mountains of the Big Hole River valley, no decrease in canopy cover except in the case of conifer encroachment.	No change	DEQ TMDL (Table 7-2)
	Conservation and restoration of riparian habitats by fencing, off-channel livestock watering facilities, prescribed grazing plans, more active livestock management, etc. • Frequency of livestock presence in riparian areas with decrease significantly during first 5 years leading to rapid improvement. • Steady riparian recovery thereafter with "sustainable" status achieved on 95% of enrolled lands by year 15. Current Riparian Assessment Rankings: • 9.5 miles "Not Sustainable" • 110 miles "At Risk" • 57 miles "Sustainable" • 176.5 total assessed miles	68% or 119.5 miles of enrolled lands need to achieve "Sustainable Rating" Priority Areas: Sections C & D of CCAA (near Wisdom)	CCAA (Table 5)
Width-Depth Ratio (w/d ratio)	On the Big Hole River, decrease the median w/d ratio from 34 to <= 22	35% decrease in width-to-depth	DEQ TMDL (Table 7-2)
	On tributary streams in the Big Hole River valley bottom, decrease the median w/d ratio from 15 to <= 14	6% decrease in width-to-depth	DEQ TMDL (Table 7-2)
	On tributary streams in the Big Hole River valley mountains, no human caused increases in W/D ratio.	No change	DEQ TMDL (Table 7-2)
Irrigation Return Flow	On the Big Hole River and its tributaries, unknown, but likely a minor source. Address in adaptive management.	If present, reduce warm water irrigation return flows by 50%.	DEQ TMDL (Table 7-2)

In-Stream Flow	Big Hole River and its tributaries, stream flows are often below the 60cfs target and the minimum survival flow of 20cfs at the Wisdom bridge.	All reasonable irrigation water management practices with water savings applied to in-stream flow via local, voluntary approach.	DEQ TMDL (Table 7-2)
	Increased flows through: water rights compliance, improved irrigation management, less water intensive crops, instream flow leases, stockwater wells, etc. (Table 5, CCAA Plan)	Water right compliance, installation of headgates/measuring devices within 5 years of enrollment As part of landowner site plans, ensure streamflows meet flow targets 75% of the time by 2015.	CCAA (Table 5)
Sediment	Eroding Banks [current load 3126 tons/year] Upland Natural Sources [current load 1313 tons/year] Uplands grazing and hay lands [current load 788 tons/year] Unpaved roads [current load 101 tons/year) Upland Silviculture [current load 65 tons/year] Highway 43 Sanding [current load 2.4 tons/year] *Total sediment Load [current load 5395 tons/year]*	17% reduction NA 66% reduction 29% reduction No increase No increase 12% reduction	DEQ TMDL Table 8-23
Arctic Grayling Population	Positive trend grayling population within 5 years (2010)	n/a	CCAA
	Grayling reoccupation of historic waters within 10 years (2015)	n/a	CCAA
Nutrients	Immediate reduction in threat at time of site specific plan implementation	varied	CCAA
	See TMDL Tables 9-2 to 9-5 for detailed nutrient load allocation. While nutrient loads were estimated for sources that include hay and pasture, shrub and grassland, forest, development, and streambanks, the greatest reduction contribution potential is from riparian zones for either reduced nutrient source and/or nutrient filtration/uptake.	27%-30% reduction in nitrogen 33%-36% reduction in phosphorus	DEQ TMDL (Tables 9-2 to 9-5)

Section IV: How Will We Get There?
Road Map to Watershed Restoration

Restoration activities that can support improvements in water quality as defined in the previous section are divided into four watershed restoration goals:

- Plan & Research
- Restoration
- Education
- Preservation

In order to achieve water quality goals and ultimately our vision for the Upper Big Hole watershed, activities will need to occur in each of the four categories for a balanced approach to restoration that is calculated, timely, sustainable, and cost effective.

In addition, significant restoration activity has occurred since 2004 when the TMDL data was collected.

This section includes activities for watershed restoration in each of the four categories. Activities in each category that have occurred between 2004 and the present are listed and are followed by proposed future activities. Each activity's anticipated watershed restoration impact is listed. For future activities anticipated costs and funding sources are indicated.

The watershed restoration categories are:

Watershed Restoration Goal Category
Water Temperature
Stream Flow
Sediment
Nutrients
Fish & Wildlife
Weeds/Invasive Species
Regulatory Protections

Plan & Research

Plan & Research - Since 2004:

Year	Project	Watershed Restoration Category	Lead	Reference or Contact
2004	Inventory of Irrigation Infrastructure and General Habitat Conditions, Upper Big Hole Watershed	Stream flows	BHRF	(DTM Consulting, Inc., Applied Geomorphology, Inc., August 2005)
2005	CCAA Plan for Arctic Grayling	Stream flows, water temperature, sediment, nutrients, fish & wildlife, other	CCAA	(Montana Fish, Wildlife and Parks and the U.S. Fish and Wildlife Service, 2006)
2005	Big Hole Water Storage Scoping Project and Water Management Review - Reservoir Storage Alternatives	Stream flows	BHWC, BHRF	(Portage Environmental, Inc., DTM Consulting, Inc., Mainstream Restoration, Inc., August 2005)
2005	Big Hole Water Storage Scoping Project and Water Management Review - Water Management Alternatives	Stream flows, water temperature	BHWC, BHRF	(Portage Environmental, Inc., DTM Consulting, Inc., Mainstream Restoration, Inc., September 2005)
2006	Vegetation Change and Impacts to the Annual Water Budget Big Hole River	Stream flows	BHWC	(DTM Consulting, Inc., 2006)
2007	Montana Non-Point Source Management Plan	Stream flows, water temperature, nutrients, sediment, metals	DEQ	(Montana Department of Environmental Quality, 2007)

2007	Big Hole Valley Bird Surveys Final Report	Fish &wildlife	Avian Science Center, BHWC	(Cilimburg, 2007)
2008	Modeling Streamflow and Water Temperature in the Big Hole River, Montana - 2006	Stream flows, water temperature	DEQ	(Flynn, 2008)
2008	Beaverhead West Environmental Assessment	Stream flows, water temperature	BLM	(U.S. Bureau of Land Management, 2008)
2008	Groundwater and Surface Water in a Study Area within the Upper Big Hole Basin	Stream flows, water temperature	MBMG, DNRC, BHWC	(Abdo & Roberts, August 2008)
2009	Upper and North Fork Big Hole River Planning Area TMDL	Stream flows, water temperature, nutrients, sediment, metals	DEQ	(Montana DEQ, June 2009)
2009	US Forest Service Beaverhead Deer Lodge National Forest Plan	Nutrients, water temperature, fish & wildlife, other	USFS	(US Forest Service, 2009)
2009	Upper Big Hole River Watershed Assessment Report	Stream flows, water temperature	BLM	(U.S. Bureau of Land Management, 2009)
2010	Analysis of Sediment Load Reductions from the Culvert Replacement on Skinner Meadows Road at Governor Creek, Jackson, Montana	Sediment	Beaverhead County/BHWC	(Watershed Consulting, LLC, Great West Engineering, Inc., 2010)
2010	Big Hole River Thermal Infrared (TIR) Temperature Analysis Interpretive Report	Water temperature	USGS, BHWC	(Watershed Consulting, LLC, July 2010)
2010	Freshwater Mussels in Montana: Comprehensive Results from 3 years of SWG Funded Surveys	Fish & wildlife	Montana Natural Heritage	(Stagliano, 2010)
2006-11	Willow Banking	Water temperature, sediment	USFWS	CCAA
2006-	Stream Gaging	Stream flows, water temperature	DNRC, BHWC	CCAA
2008-12	Fluvial Arctic Grayling Pit Tag Project	Fish & wildlife	MSU, BHWC	MSU
2011	Beaver Habitat Suitability Model: Big Hole Watershed, Montana	Stream flows, fish & wildlife	DEQ	(Carpenedo, March 2011)
2012	Upper Big Hole River Success Monitoring	Macroinvertebrates, stream flow, etc. Assessment	BHWC, DNRC, BHRF	BHWC
2012	Upper Big Hole River Watershed Restoration Plan	Stream flows, water temperature, sediment	BHWC	BHWC

Plan & Research - Future and In-Process:

Year	Project	Watershed Restoration Category	Lead	Cost & Funding - Source
2011-14	Linking climate impacts with action: A risk-based approach for fish conservation in the Big Hole, MT	Stream flows, water temperatures	USGS/Erin Towler, Research Fellow	Unknown - USGS
Annual (May)	CCAA Annual Report	Temperature, stream flows, fish & wildlife	CCAA	CCAA
Ongoing	CCAA Landowner Site Plans: Every enrolled landowner has a site plan developed by the CCAA program that is based on riparian condition, irrigation infrastructure, and grazing management. These site plans determine restoration objectives. There are 7 complete plans of 33 total landowners. Typically 4-5 plans are completed each year.	Temperature, stream flows, fish & wildlife, sediment, nutrients	CCAA	CCAA
5-Year Report-2017	CCAA 5-Year Report (last report was 2012, Next is 2017)	Temperature, Stream Flows, Fish & Wildlife	CCAA	CCAA
2012	Upper & Lower Big Hole Success Monitoring	Water Temperature, Stream Flows	BHWC	$7,000 - DEQ 319
2014	Watershed Assessment Review	All	BLM	BLM
2014	Identify potential wetland restoration locations that will support water quality goals, especially those wetlands that can contribute to stream flows and/or reduce water temperatures July-August.	Water Temperature, Stream Flows, Sediment, Nutrients	BHWC	$50,000 to locate sites and prioritize wetland restoration projects.
2014	Upper Big Hole & North Fork Big Hole TMDL Implementation Evaluation (TIE)	Water Temperature, Nutrients, Sediments, Metals	DEQ	Unknown - DEQ

Educate

Education - Since 2004:

Year	Project	Watershed Restoration Category	Lead
1995 -	Monthly Watershed Meetings (10 meetings/year)	All	BHWC
Annual	Watershed Tours	All	BHWC
Annual	Youth Field Days	All	BHWC
Occasional	Classroom visits to MSU, MSU-Western, University of Montana	All	CCAA
Annual	CCAA Annual/5 Year Report Presentations to local meetings of American Fisheries Society, Trout Unlimited, BHWC, etc.	All	CCAA
May/Year	Arctic Grayling Recovery Program (AGRP) Annual Meeting	All	AGRP
2008-	Kids Day on the Big Hole at Meriwether Ranch	All	BHRF
2012	"Landscape Conversations" Seminar with Montana Wildlife Society	All	CCAA
2012	Landowner Appreciation Dinner & 5 Year Report	All	CCAA

Education Future and In-Process:

Year or Time Period	Project	Watershed Restoration Category	Lead	Cost - Source
Monthly - 3rd Wednesdays	Monthly Watershed Meetings *Includes seminars on watershed topics, updates from 4 BHWC subcommittees, updates from BHWC, and new watershed news. Serves as monthly opportunity to address watershed issues. Public welcome.*	All	BHWC	$10,000/year - Private funds, project specific sources
~1/year	Watershed Tours *1-2x/year depending on topics. Public opportunity to visit projects and hear watershed restoration progress.*	All	BHWC	$4,000/year - Project specific sources
~1-2/year	Youth Field Days and School Programs *Annual events for kids grades K-8 with watershed related activities. Opportunity to build watershed stewardship among students. Field days are science based on during a normal school day. Other school events may include presentations or activities in school.*	All	BHWC	$2000/year - Project specific sources, private funds
May/year	Kids Day on the Big Hole at Meriwether Ranch *Kids invited to spend a day fishing and learning topics surrounding fishing. Program is recreation based.*	All	BHRF	Varied, but requires $2000-$5000/year
March/year	AGRP - Arctic Grayling Restoration Annual Meeting	Fish & Wildlife	CCAA/AGRP	CCAA
2012	CCAA Tour *Agencies involved in CCAA program visit Upper Big Hole to view progress.*	Fish & Wildlife	CCAA	CCAA
2012	Arctic Grayling Genetics Project - Spokane High School	Fish & Wildlife	CCAA	CCAA
Annual	CCAA Annual/5Year Report Presentations to local meetings of American Fisheries Society, Trout Unlimited, BHWC, etc.	All	CCAA	CCAA

Restore

Restoration - Since 2004:

Year(s)	Project	Watershed Restoration Category
	CCAA Segment A:	
2007	Jackson Reach Restoration	Water temperature
2008	Schindler Restoration	Water temperature
2006	Schindler Feedlot	Nutrients
2007	Dooling Livestock Well	Stream flow
2007	Mitchell Fish Ladder	Fish & wildlife
ongoing	Governor Creek Noxious Weed Treatment @ H Lazy J	Weeds
2006	M Jackson Diversions/Fish Ladders	Stream flow, Water temperature, fish & wildlife
2007	Big Hole River Livestock Well @ Dooling Livestock	Stream flow
2008	Governor Creek Culvert Replacement	Fish & wildlife
	CCAA Segment B:	
	Miner Creek Noxious Weed Treatment @ Johnson Brothers	Weeds
2008	Warm Springs Creek Riparian Fence @ Finch Ranches & Lapham Ranch Co.	Water temperature
2008	Warm Springs Stockwater/Lapham Ranch Co.	Water temperature, stream flow
2005	Johnson Headgates	Water temperature, stream flow
2007	Big Hole River Wetland Restoration @ Rocky Mountain Ranches (John Jackson)	Water temperature, stream flow, nutrients, sediment
2009	Johnson Riparian Fence	Water temperature, sediment
2006	Husted/Hirschy Diversions	Stream flow, water temperature
2008	Big Hole River Riparian Fence @ Lapham Ranch Co.	Water temperature, sediment
2008	John Jackson Riparian Fence	Water temperature
ongoing	Warm Springs Creek Noxious Weed Treatment @ Finch Ranches LLC	Weeds
ongoing	Big Lake Creek Noxious Weed Treatment @ Husted Ranch	Weeds
	CCAA Segment C:	
2008-11	Rock Creek Riparian Restoration, Fish Ladder, Stockwater wells	Fish & wildlife, water temperature, sediment, nutrients, stream flow
2008	Big Hole River McDowell Reach Restoration @ Erb Livestock	Water temperature, sediment, nutrients

2008	Huntley Irrigation Water Management Project	Stream flow
2007	Big Swamp Creek Feedlot Restoration @ Peterson Brothers Livestock Company	Nutrients
2008	Little Lake Creek Stream Restoration/Riparian Fence@ Dick Hirschy Cattle Co.	Water temperature, nutrients, sediment
2007	Big Hole River Wisdom Reach Restoration @ Erb Livestock	Water temperature, nutrients, sediment
ongoing	Rock Creek Noxious Weed Treatment @ Erb Livestock/Wisdom River, Nelson	Weeds
ongoing	Big Hole River Noxious Weed Treatment @ Erb/Hirschy Cattle/Upper Big Hole	Weeds
2003	Spokane Diversion & Fish Ladder	Water temperature, stream flow, fish & wildlife
2006	Maverick Headgate	Water temperature, stream flow
2006	Hirschy Diversion	Water temperature, stream flow, sediment
2008	Big Hole Grazing Association Stockwater Well	Water temperature, stream flow
2008	Nelson Fish Ladders (Rock, Big Lake Creek)	Fish & wildlife
2008	H.Hirschy Little Lake Stockwater Well	Water temperature, stream flow
2008	H. Hirschy Ruby Stockwater Wells	Water temperature, stream flow
2008	Hirschy Headgate and Diversion	Water temperature, stream flow
2008	Nelson Rock Creek Fence	Water temperature, nutrients, sediment
2009	Nelson Stockwater Wells	Water temperature, stream flow
2006	Huntley Fish Ladder	Fish & wildlife
2008	Wisdom River Fence (Upper Rock Creek)	Water temperature, sediment, nutrients
ongoing	Swamp Creek Noxious Weed Treatment @ Harrington Company/Erb/Nelson	Weeds
	Little Lake Creek Culvert Removal	Stream flow, fish & wildlife
ongoing	Little Lake Creek Noxious Weed Treatment @ Husted Ranch	Weeds
	CCAA Segment D:	
2008	Swamp Creek Riparian Fence @ Erb Livestock	Water temperature, sediment, nutrients
2008	Swamp Creek Fence Repair @ Harrington Company	Water temperature, sediment, nutrients
2008	Quarter Circle 3T Stockwater Well	Water temperature, stream flow
2008-11	Steel Creek Riparian Restoration (Riparian Fencing, Diversions)	Water temperature, fish & wildlife, sediment, nutrients
2010	Wisdom Sewage Treatment System	Nutrients
2011	North Fork Dolittle Creek Fish Barrier Installation	Fish & wildlife
2011	McVey Creek Barrier and WCT Restoration	Fish & wildlife
2008	Plimpton Crk/Howell Crk Riparian Fence @ Rufenacht, Erb Livestock	Water temperature, sediment, fish & wildlife
2008	North Fork Fish Screens	Fish & wildlife

Restoration - Future and In-Process:

Projected Goal Year	Management Measures - Project, Status	Watershed Restoration Category	Lead	Possible Funding Source
2013	Heidi Hirschy Swamp Creek Fence	Water temperature, sediment, nutrients	CCAA	$25,000 - CCAA
2012	Headgates (3) on Rock Creek	Water temperature, stream flow	CCAA	$75,000 - NRCS
2012	Rock Creek Fish Incubators	Fish & wildlife	CCAA	$10,000 - CCAA
2012	Stock watering system (10 tanks) - Rock Creek	Sediment, stream flow, water temperature	CCAA	$60,000 - CCAA
2013	Harrington Ranch - Fence Lower Swamp Creek	Water temperature, sediment, nutrients	CCAA	$30,000 - CCAA
2014	Hardened Cattle Crossings on Swamp Creek (2)	Sediment	CCAA	$20,000 - CCAA
2014	Riparian Fencing - Rock Creek, Guy Peterson	Water temperature, sediment	CCAA	$10,000 - CCAA
2014	Off-Site Water - Steele Creek	Sediment, nutrients, water temperature, stream flows	CCAA	$25,000 -RAC
2013	Move Husteds Feedlot	Nutrients, water temperature, sediment	CCAA	$30,000 - CCAA
ongoing	Noxious Weed Treatment on CCAA enrolled lands	Other	CCAA	$10,000/year - BLM
2013	Spokane Ditch Siphon	Fish & wildlife, stream flows	CCAA	$350,000 - Wildlife Conservation Society
2015	Adjust Grazing Management in BLM Lands: Big Swamp, Big Swamp Creek, Mussigbrod On & Off, North Fork Big Hole, Steel Creek and Warm Springs allotments. Coordinate with Wisdom Ranger District to revise grazing management that are fenced in and managed with Beaverhead–Deerlodge National Forest allotments.	Water temperature, sediment, nutrients	BLM	BLM Staff to Address
2015	Close the road between wetlands 1964 and 1994 and remove the culverts up drainage from these wetlands. Fill the drainage ditch at Camas meadow.	Sediment	BLM	BLM Staff to Address
2015	Explore opportunities to plug or obliterate old drainage ditches on the Foxtail and Big Swamp allotments.	Stream flows, sediment	BLM	BLM Staff to Address

Preserve & Protect

Preserve & Protect - Since 2004:

Year	Project, Status	Watershed Restoration Category	Lead
2000	Land Use Development Standards: Subdivision Setback: Building site must be >150ft from Big Hole River. Big Hole River Conservation Development: No structure with a roof within 500ft of Big Hole River Floodplains: Building in 100 year floodplain requires mitigation. Septic/Sewage: All buildings required to have water and sewer.	Water temperature, sediment, nutrients, regulatory protections	BHWC, FutureWest, Counties
1997 -	Big Hole River Drought Management Plan	Stream flows, water temperature	BHWC, DNRC, FWP
2012	The Nature Conservancy Lands (40,000 acres) --- currently being transferred to USFS.	All	The Nature Conservancy
2006	Beaverhead County Growth Policy	All	Beaverhead County
2011	Anaconda Deer Lodge County Growth Policy	All	Anaconda Deer Lodge County

Preserve & Protect - Future and In-Process:

Year	Project, Status	Watershed Restoration Category	Lead, Partner	Cost - Source
2012-2013	Floodplain Approximate Zone A mapping to be complete November 2012. The state of Montana will adopt the maps. Anaconda-Deer Lodge, Beaverhead and Madison counties will seek county adoption of the maps followed by their own regulatory ordinances associated with the maps. This will provide a strong regulatory environment to protect the river corridor.	Water temperature, sediment, nutrients, regulatory protections	BHWC, Future West, Beaverhead, Butte-Silver Bow, Madison and Anaconda-Deer Lodge Counties, DNRC	Ongoing - FutureWest, DEQ, BHWC, Counties, DNRC
2010-	Land Use Planning Incentive Program - Payment for Ecological Services	Water temperature, sediments, nutrients, fish & wildlife, stream flow	BHWC, FutureWest, Counties	Ongoing - FutureWest, DEQ, BHWC, Counties
January/Year	Big Hole River Drought Management Plan - review and update annually	Water temperature, stream flow	BHWC, DNRC, FWP	$3000 annually - DEQ, BHWC
varied	Use Easements for protection	Water temperature, nutrients, sediment, fish & wildlife	BHWC and Partners	Varied - many sources
2013	Beaverhead County Growth Policy Update: Advocate for watershed protections to be included in the growth policy	All	BHWC, Future West	Beaverhead County

Partner

Partnership Collaborative Existing & Ongoing:

Project, Status	**Watershed Restoration Category**
Missouri Headwaters Partnership - Annual meeting each fall.	All
Wildlife Conservation Society - Wolf deterrence, watershed restoration	All
Montana Watershed Coordination Council (MWCC) - Coordination between watershed groups. Annual meeting and education programs.	All
Montana Non-Profit Association (MNA) - Annual meeting each fall. BHWC's attendance brings watershed groups to the table with statewide non-profits and non-profit management.	All

See next page (partners list) for a list of individual groups involved in the Upper Big Hole River watershed.

Partners

The stakeholders of the Big Hole watershed and those who work, live and play here have a strong sense of partnership, from helping a neighbor or serving the community, to leveraging resources to accomplish big goals. There are many partners involved in the watershed and its restoration. Many have individual goals or methods, but in mass they have one common goal - to restore the watershed to fully functioning to sustain ranching, fish and wildlife, water quality, and communities. Each partner listed is also a link:

Conservation Groups & Related Non-Profit Organizations

- American Fisheries Society (AFS) Montana Chapter
- American Rivers
- Arctic Grayling Recovery Program (AGRP)
- Center for Biological Diversity
- Big Hole River Foundation (BHRF)
- Big Hole Watershed Committee (BHWC)
- Ducks Unlimited, Inc.
- Missouri Headwaters Partnership (MHP)
- Montana Association of Land Trusts
- Montana Audubon
- Montana Land Reliance
- Montana Natural Heritage Program
- Montana Non-Profit Association (MNA)
- Montana Trout Unlimited (TU)
- Montana Watershed Coordination Council (MWCC)
- Montana Wetlands Legacy Partnership
- National Fish Habitat Action Plan
- People and Carnivores
- Pheasants Forever - Beaverhead Chapter
- Rocky Mountain Elk Foundation (RMEF) Montana
- The Conservation Fund
- The Nature Conservancy (TNC)
- The Trust for Public Land
- Western Native Trout Initiative
- Wildlife Conservation Society (WCS)
- Wildlife Society - Montana Chapter

Agencies

- Montana Bureau of Mines & Geology (MBMG)
- Montana Department of Environmental Quality - Water Quality Bureau (MDEQ)
- Montana Department of Natural Resources & Conservation (DNRC)
- Montana Department of Transportation
- Montana Fish, Wildlife & Parks
- Natural Resources Conservation Service (NRCS)
- US Forest Service Beaverhead Deer Lodge National Forest - Wisdom Ranger District (USFS)
- US Bureau of Land Management - Dillon Field Office (BLM)
- US Fish & Wildlife Service - Partners Program
- US Geological Survey (USGS)
    - USGS Climate Change Center

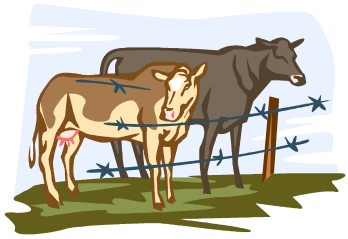
Local Government & Conservation Districts

- Beaverhead County
- Beaverhead Conservation District

Educational Institutions

- **Rural Schools:** Jackson School grades K-8, Wisdom School grades K-8
- University of Montana Western Environmental Studies & Biology Programs
- Montana Tech
- University of Montana
    - Avian Science Center
- Montana State University
    - Montana State Fisheries Cooperative Unit (MTCFRU)

Best Management Practices



The Big Hole watershed has a reputation for its progressive, grassroots efforts towards watershed restoration. This is largely due to the immense challenges the watershed has faced in the last two decades and the dedication of the people who live and work here. As a result, many of the restoration and management tactics used are bottom-up. That is, they are developed by the people who use them. Therefore, we know the practices are used since they are bought-into, they are reasonable, and they are effective. They are also voluntary, yet see a high rate of participation and support. Many of the methods rely on conversations, understanding, long-term solutions that work for all (consensus), partnership/coordination, and education. Our Best Management Practices mirror this approach. See Table 13 for Best Management Practices.

Table 13: Best Management Practices

Management Strategy	Watershed Restoration Category	Schedule
Education *Private land ownership and public land manager buy-in to restoration goals is critical to ensure their participation and support.*		
Request reporting of progress annually from CCAA program, USFS, BLM and BHWC (Watershed Restoration Plan review, report on progress). Presentations will be made to the Big Hole Watershed Committee meetings.	All	BHWC meetings occur monthly. Each group will be invited to present 1 time/year.
Provide public opportunity for involvement to promote restoration goals. This occurs through student education, public tours, seminars, web and social media management, printed media, etc.	All	Several times annually/ongoing
Encourage involvement, partnership and collaboration from diverse viewpoints and open communication.	All	
Drought Management The BHWC Drought Management Plan includes triggers and voluntary actions to increase stream flow and/or decrease water temperature during times of drought. This plan is reviewed annually and implemented when triggers are met. Enrolled landowners in the CCAA program follow additional drought management triggers.	Temperature Stream Flow Fish& Wildlife	Reviewed annually, implemented as needed.
Irrigation Infrastructure *Just as it is important to restore the watershed, it is equally important to maintain the ranching operations located in the valley. While irrigation is critical to watering stock and pasture for feed production, infrastructure improvements can improve efficiency.*		

Replace/improve all headgates located on rivers and tributaries to allow water control, water measurement, and fish passage/deter fish entrainment. Install stockwater tanks when doing so would provide an instream water savings.	Stream Flow, Temperature Fish In some cases, sediment Stream Flow, Temperature	One per year until complete - led by CCAA program, supported by BHWC. As needed
Riparian Vegetation *The TMDL describes making all reasonable efforts to increase riparian vegetation and improve irrigation systems to decrease sediment loading, increase stream flows, and decrease temperatures* (Montana DEQ, June 2009).*The restoration of riparian vegetation was identified in the TMDL as the top rated activity to achieve multiple watershed restoration goals. Several projects to improve riparian restoration in the Upper Big Hole River have been completed, both through active manipulations (i.e. plantings, machine manipulated channels) and passive (i.e. fencing to reduce grazing pressure) restoration. In a 5-year review of the CCAA program, staff report passive restoration is the best means of riparian restoration for use of funds and results. Therefore, efforts in riparian restoration will focus on passive restoration. In select cases, active restoration may need to supplement passive restoration.* BLM: Review grazing leases with USFS, to promote healthy riparian zones and wetlands. USFS: Review grazing leases with BLM to promote healthy riparian zones and wetlands and to sustain the fishery. CCAA: Continue implementation of grazing management plans including the use of riparian fencing to reduce riparian pressure and allow riparian zones to heal.	Nutrients Sediment Stream Flow Temperature Fish & Wildlife	On-going
Wetlands *Wetlands can be a resource in improving water quality. Wetlands may retain water for late season flows, cool waters, uptake nutrients, or absorb sediments. The restoration of degraded wetlands can provide a positive impact to water quality.* BLM: Cites degraded wetlands. Work with BLM staff on remedy. USFS: Identify degraded wetlands for possible restoration CCAA: Support incorporation of wetlands in Landowner Plans as a	Stream Flow Temperature Nutrients Fish & Wildlife	Identify opportunities - 2013

grazing management or irrigation management strategy. Support restoration as needed. Other: Support restoration of wetlands outside of the CCAA enrolled lands, USFS and BLM lands. Identify locations of potential wetland opportunities that may improve water quality. Support efforts that can protect existing wetlands, such as easements.	Sediment	
Regulatory Environment *Regulations are an important tool for long-term watershed protections. An existing 150 foot development setback is in place and growth policies touch on the importance of resources in the Big Hole watershed. The following are guidelines for a positive regulatory environment:* 1. Land use development standards should be in place to adequately protect the most sensitive watershed resources, particularly those under restoration currently (this includes riparian zones and wetlands) from development. 2. Incentives should be used to encourage landowner driven conservation, such as the use of easements and payment for ecological services. 3. County Growth Policies should reflect the importance the protection of watershed resources in the Big Hole watershed for water quality, tourism, fish and wildlife, and rural landscape.	Regulatory protections	In-process

Section V: How Will We Know When We Arrive?

Each plan discussed in this document describes its own goals, priorities and milestones. Yet, in mass many goals lead to improved water quality. The milestones, criteria and monitoring plans of each are summarized below. Success documented by these groups using their own criteria can show positive change in the watershed. This is followed by broader watershed milestone, criteria and monitoring. The professionals leading the plans for the CCAA, USFS, and BLM are dedicated and with a high skill level. The best use of resources is to refer to their work in assessing success. The monitoring components are provided in Table 14. Progress in watershed restoration can be tracked by achieving interim milestones, provided in Table 15. Finally, success targets can be viewed in Table 16.

Table 14: Monitoring components, responsible party, and occurrence.

Monitoring Component	Primary Responsibility	Source	When
Stream Flows • *USGS Gaging Stations* • *Individual Measurements* • *TruTracks*	DNRC	CCAA	CCAA reports annually and every 5 years.
Water Temperature • *USGS Gaging Stations* • *Individual Measurements* • *TruTracks* • *Temperature Loggers*	DNRC, DEQ	CCAA, DEQ (TMDL)	CCAA reports annually and every 5 years TMDL Implementation Evaluation (approx. 2014)
Fish & Wildlife Arctic grayling Other Fish & Wildlife	 FWP FWP	 CCAA, FWP Individual projects	 CCAA reports annually and every 5 years FWP reports are project specific.
Education and Outreach	BHWC, others	Attendance and involvement tracking	BHWC reports annually.
Weeds	BHWC, Counties, FWP	CCAA, varied	CCAA reports annually and every 5 years Other weed support provided as needed.

Table 15: Watershed restoration interim milestones.

Milestone	End Point
Irrigation Infrastructure: Minimum one improvement per year (headgate, diversion, flow measurement or stockwater tank)	All irrigation infrastructure is updated to allow for water control, water efficiency, water measurement and adequate diversion that does not cause stream degradation.
Minimum one riparian improvement project per year in a stream reach as identified as having sparse or moderate riparian density.	95% of CCAA enrolled lands have a riparian condition rating of sustainable.
10 public opportunities each year to participate in watershed restoration, i.e. tours, seminars, meetings, etc.	No end point
Meet with each of the following one time annually to identify needs for watershed restoration and to report progress on watershed restoration: • DEQ • USFS • BLM • CCAA • MFWP	No end point

Table 16: Overarching watershed restoration success indicators.

Restoration Success Indicator	Goal
Positive restoration results in the CCAA restoration plan upon 5 year reviews	Results reported to BWHC every 5 years. Positive trends are based on CCAA approved monitoring plans and results.
Positive restoration results in BLM watershed assessments every five years.	BLM Watershed Assessment reviewed every 5 years. Positive trends are based on BLM approved monitoring plans and results.
Positive restoration results in USFS efforts every three years.	Request updates from USFS every three years. Positive restoration includes expanded westslope cutthroat trout habitat, road improvements or closures that reduce sediment input, riparian restoration, etc.
Declining trend in water temperature over 10 year period.	Negative trend in water temperature is calculated as average water temperature from Wisdom and Mudd Creek stream gages over a 10 year period July - September. Declining trend = average water temperature July - September is declining.
Positive trend in stream flow over 10 year period.	Positive trend in stream flow is calculated as average stream flow from Wisdom and Mudd Creek stream gages over a 10 year period July - September. Positive trend = average stream flow July - September is increasing.
Positive riparian vegetation growth throughout the Upper Big Hole watershed.	Photo monitoring using both on site before and after photos and aerial photos or software.
Improve all river sources of irrigation withdrawals.	All irrigation structures are improved with flow measurement and fish passage.
100% participation in Drought Management	All irrigators and river users participate in the BWHC Drought Management Plan and/or the CCAA Drought Management Plan.
High education & engagement numbers in watershed activities.	A wide range of stakeholders and high number of stakeholders continue to regularly attend and engage in the restoration work of the Upper Big Hole watershed. Measured by BHWC meeting attendance, online activity, and annual donations.
Regulatory environment provides increasing protections of sensitive watershed areas.	The number of easements or other land conservation protection measures are increasing. The development standards in the watershed protect sensitive riparian zones and wetlands from development and continue to strengthen.

Section VI: Discussion, Recommendations & Review

In the 1980's and 1990's the Big Hole watershed, and particularly the Upper Big Hole watershed, faced challenges that at the time seemed insurmountable. Ranchers, agencies, and other stakeholders were at odds. The drought, the dry river bed, the rapidly declining Arctic grayling population, and ranch livelihoods on the line resulted in an ugly finger pointing battle.

Fast-forward 20 years: while drought has reoccurred, the river has not run dry. The Arctic grayling numbers are no longer declining, and are instead increasing. Landowners of the Upper Big Hole have embraced the notion of coexistence -- what's good the for watershed is good for ranching and good for neighbors. Agencies have embraced the notion of coexistence as well, with partnerships with landowners, listening to needs, and adapting restoration to meet those needs.

Coexistence has become the culture in the Upper Big Hole, from predator deterrence to reduce wolf-human conflicts, to enrolled state and private lands in the CCAA program, to continued consensus based efforts of the BHWC, and the shared sacrifice of the Drought Management Plan.

Coexistence, or the collaboration and education of stakeholders, is why restoration is working in Upper Big Hole. It is trust and relationship building, teamwork, and patience. It is critical that this culture continues into the future for continued success. Without this continued culture, much of the work done to this point will unravel and be lost effort.

Much of this plan points to the coexistence culture as a high priority for restoration. Coexistence is not measured in, for example, miles of river restored or sediment load reduced. Therefore, indicators are developed to take into account a broader scope of restoration success, one that occurs over a long period and over a broad area. In reality, this broad scope for long-term success both fits the vision for the Big Hole watershed and is representative of a cumulative watershed effect.

Review the Watershed Restoration Plan

The Watershed Restoration Plan was compiled by the BHWC. The plan reviewed and takes into account existing plans and known upcoming projects. The next review of this plan should occur in 2015.

The 2015 review should include the revised BLM Watershed Assessment and the results of several monitoring and research studies that are currently in process. The results of those works will prove beneficial in future decision making. The 2015 version should also include updates in the Land Use Planning process and the updated Beaverhead County Growth Policy.

Note that 2015 is also one year after the 10th anniversary of the TMDL data collection for the Upper Big Hole watershed. It may be appropriate at this time to review the targets and criteria of impairment and revise recommendations based on restoration. The Watershed Restoration Plan should be updated whenever a major landmark in the restoration plans occurs, such as a CCAA 5-year review, updated Forest Plan, updated BLM Watershed Assessment or other milestone.

Sub-Watershed Summaries

The Upper Big Hole can be subdivided into smaller watershed basins (HUC 5). The sub-basins are ordered in the following pages upstream to downstream. Within each subbasin, tributaries are ordered from upstream to downstream for easy reference.

Table 17: TMDL and 303d Listing Summary by HUC 5 watershed and grouped by impairment. Beneficial Uses abbreviations: N=Not Supporting, P = Partially Supporting, F=Fully Supporting. Blue regions are potential water quality impairment sources with persistence in that stream marked with an x. Red regions are possible causes with persistence marked with an x. Source: (Montana DEQ, June 2009)

Major Watersheds	Area, Square Miles	Stream Length, Miles	2012 303d Impairments (Year Listed)	Beneficial Uses				Mining							Nutrients				Physical Habitat Alterations - Sediment							Water		Mining Related Damages												Agriculture Related Damages						Road and Silviculture Related Damages					Development Related		Unspecified Damages				
				Aquatic Life	Agriculture	Drinking Water	Recreation	Arsenic	Cadmium	Copper	Lead	Mercury	Zinc	Iron	Excess Algal Growth	Phosphorus (Total)	Total Kjeldahl Nitrogen (TKN)	Nitrogen (Total)	Alteration in Streamside Cover	Low Flow Alterations	Other Anthropogenic Substrate Alterations	Physical Substrate/Habitat Alterations	Bottom Deposits	Sediment/Siltation	Turbidity	Other Flow Regime Alterations	Temperature, Water	Acid Mine Drainage	Atmospheric Deposition - Toxics	Contaminated Sediments	Abandoned Mines	Mine & Mill Tailings	Placer Mining	Dredge Mining	Erosion From Derelict Land (Barren Land)	Flow Alterations from Water Diversions	Subsurface Hardrock Mining	Irrigated Crops	Agriculture	Channelization	Hydrostructure Flow Regulation	Grazing in Riparian	Rangeland Grazing	Crop Production	Unspecified Unpaved Road or Trail	Forest Roads (Road Construction & Use)	Silviculture	Highway Runoff	Highway Infrastructure	Onsite Treatment Systems (Septic, etc)	Site Clearance (Land Development or Redevelopment)	Loss of Riparian Habitat	Natural Sources	Habitat Modification	Dam Construction	Streambank Modification/destabilization
Upper Big Hole River																																																									
Big Hole River - Headwaters to Pintlar Creek		**65.16**		P	F	F	P									X			X	X				X			X												X	X				X							X				
Governor Creek	136.6																																																						
Governor Creek		18.91	Copper (2000)	N	F	F	P			X									X	X	X	X		X																X	X		X	X							X				
Pine Creek		5.37	Phosphorus (Total) (2006)	P	F	F	F								X				X					X																																	
Fox Creek		6.85	Phosphorus (Total) (2006)	P	F	F	F								X									X																				X												
Warm Springs Creek	90.4																																																						
Warm Springs Creek (Headwaters to Mouth)		20	Nitrogen (Total), Phosphorus (Total), Sedimentation/Silt ation (2006)	P	F	F	P								X		X	X	X					X																		X		X								X				
Headwaters - Big Hole River	250.4																																																					
Miner Creek	30.1	21.88		P	I	I	F																	X																		X												
Big Hole River - Wisdom	297.4																																																					
Rock Creek		25.62	Phosphorus (Total), Nitrogen (Total) (2002)	P	F	F	F								X		X	X	X		X			X																		X	X		X	X							X				
Swamp Creek	52.2	24.51	Nitrogen (Total), Phosphorus (Total) (2006)	P	F	F	N								X		X	X	X					X																		X			X								X				
Steel Creek	29.3	16.69	Cadmium, Copper (2000)	N	F	N	P		X	X					X		X	X	X	X	X			X				X														X	X		X	X	X						X				
Francis Creek	26.1	8.81		P	F	F	F								X		X	X						X																																
North Fork Big Hole River	281.1																																																					
North Fork Big Hole River (Headwaters to Mouth)	46.3	25.92		P	F	F	P												X	X				X																		X			X	X							X				
Upper Trail Creek (Headwaters to Joseph Creek)	38.9	13.07		N	F	F	F															X		X																				X		X									X
Joseph Creek		7.29	Lead Copper (2002)	P	F	N	F			X	X											X		X															X							X			X							
Lower Trail Creek	26.6	10.88		P	F	F	F															X		X																				X		X									X
Ruby Creek	38.5	18.8		P	F	F	P												X	X		X		X						X									X			X	X	X	X		X								
Tie Creek	31.4	16.49	Nitrogen (Total) (2006)	P	F	F	F											X				X		X																				X		X										
Johnson Creek	39.9	15.7	Nitrogen (Total) (2006)	P	F	F	P											X	X	X				X																		X			X											
Schultz Creek			Sedimentation/Silt ation (1992)	P	F	F	F																	X																					X	X									
Mussigbrod Creek	26.7	14.62	Lead (2000)	N	F	N	P				X								X	X	X	X		X			X														X	X		X	X	X						X	X			
Big Hole River - Squaw Creek	217.9																																																					
McVey Creek	15.1	9.48	Phosphorus (Total), Nitrogen (Total) (2006)	P	F	F	F								X		X		X					X																																
Doolittle Creek	22.4	5.59		P	F	F	P												X	X				X																		X	X									X		
Pintler Creek	29.7	21.25	Temperature, water (2000)	P	F	F	P													X		X				X	X														X			X	X							X	X			

Upper Big Hole Watershed - Whole

Water Quality Issues:

303D Listed Streams: 18 streams listed - see **Table 17** for streams

Huc 5 Watersheds within the Upper Big Hole Watershed

- Governor Creek
- Warm Springs Creek
- Big Hole River Headwaters
- Big Hole River Wisdom
- North Fork Big Hole River
- Squaw Creek

Major Tributaries:

Governor Creek
Warms Springs Creek
North Fork Big Hole River

Major Issues: Fluvial Arctic Grayling, Wolves, Drought, High Water Temperatures, Lack of Riparian Vegetation

Plans in place:

- USFS Beaverhead Deer Lodge National Forest - Forest Plan
- Montana Fish, Wildlife & Parks - Conservation Strategy
- Big Hole Watershed Committee Drought Management Plan
- Bureau of Land Management Dillon Field Office Upper Big Hole Watershed Assessment
- Partners for Fish and Wildlife CCAA

Ownership: USFS Beaverhead Deer Lodge National Forest & Anaconda-Pintler Wilderness, DNRC, BLM, National Park Service (National Battlefield), Private Lands, The Nature Conservancy (soon to be USFS).

High Priority Abandoned Hardrock Mines:

- Ajax (Swamp Creek headwaters) - Gold
- Trail Creek (Ruby Creek headwaters) - Gold & Silver
- Wisdom (headwaters of Steele, Doolittle, McVay, Sane, Sheep Creeks & Fox Gulch) - Gold & Silver

TMDL Recommendations:

- *Sediment Load Reduction:* Current load = 141,976 tons/day. TMDL Sediment Load reduction 31%.Top ranked remedy is "eroding banks needing sustainable riparian zone vegetative condition" *Source:* (Montana DEQ, June 2009) - *Table 10-1*

Governor Creek

Water Quality Issues Summary: Nutrients, Physical Habitat Alterations from Agriculture, Roads

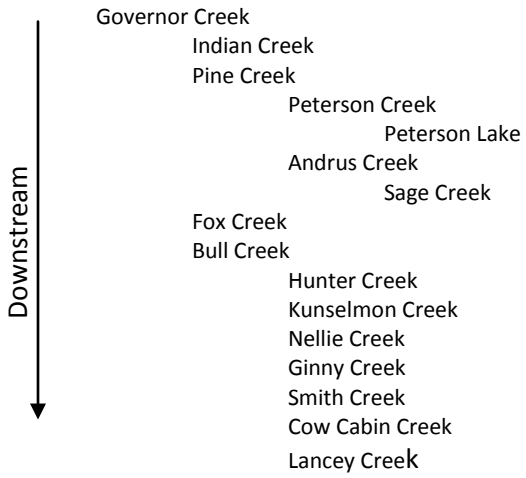
303d Listed Streams: Governor Creek, Pine Creek, Fox Creek

Area: 136.6 square miles *Hydrologic Unit Code:* 1002000401

HUC 6 Watersheds within Governor Creek watershed:

- Andrus Creek: 27.1 square miles
- Upper Governor Creek: 30 square miles
- Bull Creek: 49.7 square miles
- Lower Governor Creek: 29.8 square miles

Tributaries:



TMDL Recommendations:

- *Fox Creek Sediment Load Reduction:* Current load = 2,759 tons/day. TMDL Sediment Load reduction 41%.Top ranked remedy is "eroding banks needing sustainable riparian zone vegetative condition" *Source:* (Montana DEQ, June 2009) - *Table 10-1*
- *Governor Creek Sediment Load Reduction:* Current load = 25,646 tons/day. TMDL Sediment Load reduction 41%.Top ranked remedy is "eroding banks needing sustainable riparian zone vegetative condition" *Source:* (Montana DEQ, June 2009) - *Table 10-1*
- *Pine Creek Sediment Load Reduction:* Current load = 961 tons/day. TMDL Sediment Load reduction 46%.Top ranked remedy is "eroding banks needing sustainable riparian zone vegetative condition" *Source:* (Montana DEQ, June 2009) - *Table 10-1*

USFS Fish Key Watersheds: Andrus Creek, Fox Creek

Warm Springs Creek

Water Quality Issues Summary: Nutrients and Physical Habitat Alterations due to agriculture.

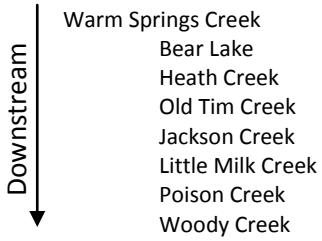
303d Listed Streams: Warm Springs Creek

Area: 90.4 square miles *Hydrologic Unit Code:* 1002000402

HUC 6 Watersheds within Warm Springs Creek watershed:

- Upper Warm Springs Creek: 20.6 square miles
- Old Tim Creek: 22.9 square miles
- Lower Warm Springs: 46.9 square miles

Tributaries:



Major Infrastructure & Events: Jackson Hot Springs Lodge, Highway 278

TMDL Recommendations:

- *Warm Springs Creek Sediment Load Reduction:* Current load = N/A tons/day. TMDL Sediment Load reduction N/A%. Top ranked remedy is "eroding banks needing sustainable riparian zone vegetative condition" *Source:* (Montana DEQ, June 2009) - *Table 10-1*

BLM Allotments: Fox Gulch (Unleased), Inabnit Butte (unleased), Warm Springs #20596

Big Hole Headwaters

Water Quality Issues Summary: Sedimentation due to roads and agriculture. *303d Listed Streams:* none

Area: 250.4 square miles *Hydrologic Unit Code:* 1002000403

HUC 6 Watersheds within Big Hole Headwaters watershed:

- Headwaters Big Hole River: 34.4 square miles
- Big Hole River - Saginaw Creek: 24.4 square miles
- Berry Creek: 15.0 square miles
- Englejard Creek: 29.3 square miles
- Big Hole River - Spring Creek: 33.5 square miles
- Miner Creek: 30.1 square miles
- Little Lake Creek: 24.5 square miles
- Big Swamp Creek: 24.9 square miles
- Big Hole River - Swamp Creek: 34.3 square miles

Tributaries:

Big Hole River Headwaters
Blind Canyon Creek
Jahnke Creek
Jahnke Lake
Van Houten Lakes North & South
Pioneer Creek
Highup Lake, Pioneer Lake
Englebaugh Creek
Berry Creek
Berry Lake, Timberline Lake
Little Swamp Creek
Englejard Creek
Hamby Creek
Hamby Lake, Lake Geneva
Spring Creek
Saginaw Creek
(Gravelle Creek)
Miner Creek
Upper Miner Lakes, Rock Island Lakes
Kelly Creek
Lower Miner Lakes
Little Lake Creek
Little Lake
Big Swamp Creek
Ajax Lake, Albino Lake, Lena Lake, Hidden Lake
Slag-a-melt Creek
Slag-a-melt Lakes
[Big Hole River confluence of Warm Springs Creek & Governor Creek]

Major Infrastructure & Events: Town of Jackson, Jackson Hot Springs Lodge

High Priority Abandoned Hardrock Mine: Ajax (Swamp Creek headwaters) - Gold

TMDL Recommendations: Miner Creek Sediment Load Reduction: Current load = 3,698 tons/day. TMDL Sediment Load reduction 17%.Top ranked remedy is "upland sediment from grazing" -- (Montana DEQ, June 2009) - Table 10-1

USFS Restoration Watershed: Saginaw Creek / *BLM Allotments:* Miner Creek (unavailable)

Big Hole River - Wisdom

Water Quality Issues Summary: Metals due t past mining activity, Nutrients and Physical Habitat Alterations due to agriculture.

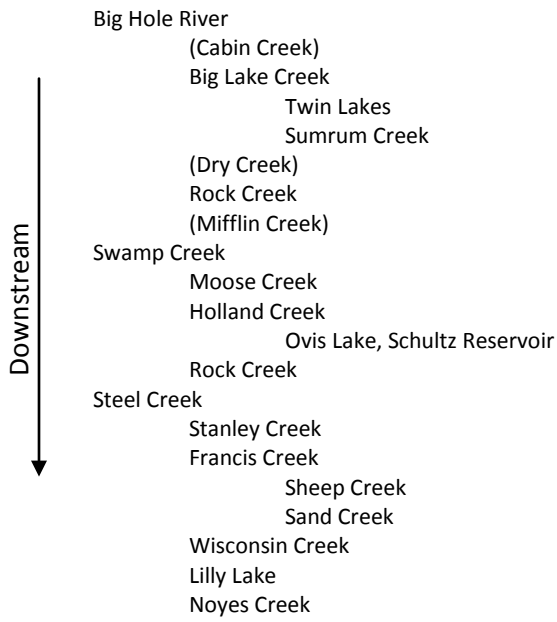
303d Listed Streams: Rock Creek, Swamp Creek, Steel Creek

Area: 297.4 square miles *Hydrologic Unit Code:* 1002000404

HUC 6 Watersheds within the Big Hole River - Wisdom watershed:

- Stanley Creek: 19.5 square miles
- Francis Creek: 26.1 square miles
- Steel Creek: 29.3 square miles
- Big Lake Creek: 47.5 square miles
- Upper Rock Creek: 46.1 square miles
- Lower Rock Creek: 17.2 square miles
- Big Hole River - Wisdom: 31.0 square miles
- Swamp Creek: 52.2 square miles
- Big Hole River - McVey Homestead: 28.4 square miles

Tributaries:



Major Infrastructure & Events: Town of Wisdom, Wisdom Sewage Treatment, USGS Gage Site - Wisdom Bridge

TMDL Recommendations:

- *Francis Creek Sediment Load Reduction:* Current load = 2,279 tons/day. TMDL Sediment Load reduction 23%.Top ranked remedy is "eroding banks needing sustainable riparian zone vegetative condition" *Source:* (Montana DEQ, June 2009) - *Table 10-1*

- *Rock Creek Sediment Load Reduction:* Current load = 7,084 tons/day. TMDL Sediment Load reduction 31%.Top ranked remedy is "eroding banks needing sustainable riparian zone vegetative condition" *Source:* (Montana DEQ, June 2009) - *Table 10-1*
- *Steel Creek Sediment Load Reduction:* Current load = 8,081 tons/day. TMDL Sediment Load reduction 34%.Top ranked remedy is "eroding banks needing sustainable riparian zone vegetative condition" *Source:* (Montana DEQ, June 2009) - *Table 10-1*
- *Swamp Creek Sediment Load Reduction:* Current load = 5,824 tons/day. TMDL Sediment Load reduction 27%.Top ranked remedy is "eroding banks needing sustainable riparian zone vegetative condition" *Source:* (Montana DEQ, June 2009) - *Table 10-1*

BLM Allotments: Steel Creek #10743, Big Swamp Creek #20715, Big Swamp #10141, Swamp Creek (unavailable), Dry Creek #20104, Jumbo Mountain #20721, Dry Creek (unavailable)

North Fork Big Hole River

Water Quality Summary: Metals due to mining, Nutrients due to agriculture, Physical Habitat Alterations due to agriculture and roads.

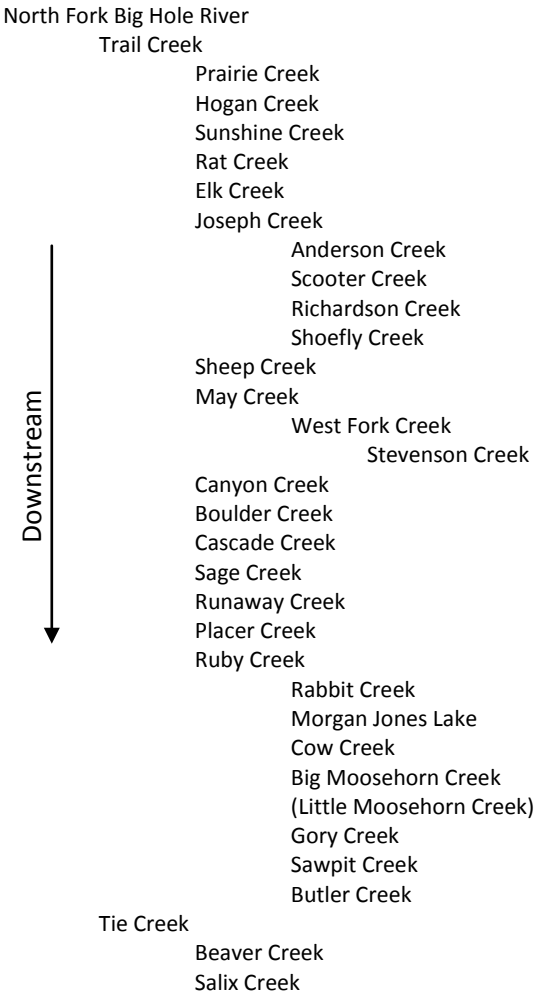
303d Listed Streams: Joseph Creek, Tie Creek, Johnson Creek, Schultz Creek, Mussigbrod Creek

Area: 281.1 square miles *Hydrologic Unit Code:* 1002000405

HUC 6 Watersheds within the North For k Big Hole River watershed:

- Upper Trail Creek: 38.9 square miles
- May Creek: 16.0 square miles
- Lower Trail Creek: 26.6 square miles
- West Fork Ruby Creek: 16.7 square miles
- Ruby Creek: 38.5 square miles
- Tie Creek: 31.4 square miles
- Johnson Creek: 39.9 square miles
- Mussigbrod Creek: 26.7 square miles
- North Fork Big Hole River: 46.3 square miles

Tributaries:



Johnson Creek
- Schultz Creek
- Nymphaea Lake
- Addition Creek
- Bender Creek

Mussigbrod Creek
- Hell Roaring Creek
  - Violet Lake, Surprise Lake
- Mussigbrod Lake

Major Infrastructure: Big Hole National Battlefield, Highway 43, Pintler (Pintlar) Lake Campground, Mussigbrod Lake Campground, North Fork Road

High Priority Abandoned Hardrock Mine: Trail Creek (Ruby Creek headwaters) - Gold & Silver

TMDL Recommendations:

- *Johnson Creek Sediment Load Reduction:* Current load = 2,432 tons/day. TMDL Sediment Load reduction 18%.Top ranked remedy is "eroding banks needing sustainable riparian zone vegetative condition" *Source:* (Montana DEQ, June 2009) - *Table 10-1*
- *Joseph Creek Sediment Load Reduction:* Current load = 990 tons/day. TMDL Sediment Load reduction 19%.Top ranked remedy is "eroding banks needing sustainable riparian zone vegetative condition" *Source:* (Montana DEQ, June 2009) - *Table 10-1*
- *Mussigbrod Creek Sediment Load Reduction:* Current load = 2,134 tons/day. TMDL Sediment Load reduction 14%.Top ranked remedy is "eroding banks needing sustainable riparian zone vegetative condition" *Source:* (Montana DEQ, June 2009) - *Table 10-1*
- *North Fork Big Hole River Sediment Load Reduction:* Current load = 28,264 tons/day. TMDL Sediment Load reduction 20%.Top ranked remedy is "eroding banks needing sustainable riparian zone vegetative condition" *Source:* (Montana DEQ, June 2009) - *Table 10-1*
- *Ruby Creek Sediment Load Reduction:* Current load = 4,791 tons/day. TMDL Sediment Load reduction 10%.Top ranked remedy is "eroding banks needing sustainable riparian zone vegetative condition" *Source:* (Montana DEQ, June 2009) - *Table 10-1*
- *Tie Creek Sediment Load Reduction:* Current load = 1,771 tons/day. TMDL Sediment Load reduction 18%.Top ranked remedy is "upland sediment from grazing" *Source:* (Montana DEQ, June 2009) - *Table 10-1*
- *Trail Creek (upper - above Joseph Creek) Sediment Load Reduction:* Current load = 2,015 tons/day. TMDL Sediment Load reduction 20%.Top ranked remedy is "eroding banks needing sustainable riparian zone vegetative condition" *Source:* (Montana DEQ, June 2009) - *Table 10-1*
- *Trail Creek Lower Sediment Load Reduction:* Current load = 5,395 tons/day. TMDL Sediment Load reduction 12%.Top ranked remedy is "eroding banks needing sustainable riparian zone vegetative condition" *Source:* (Montana DEQ, June 2009) - *Table 10-1*

USFS Restoration Watershed: Moosehorn Creek

BLM Allotments: Moose Horn #00142, Foxtail #30616, Mussigbrod On & Off #20705, North Fork Big Hole #10742

Squaw Creek

Water Quality Summary: Nutrients. Physical Habitat Alterations due to Agriculture and Highways. Some Abandoned Mines.

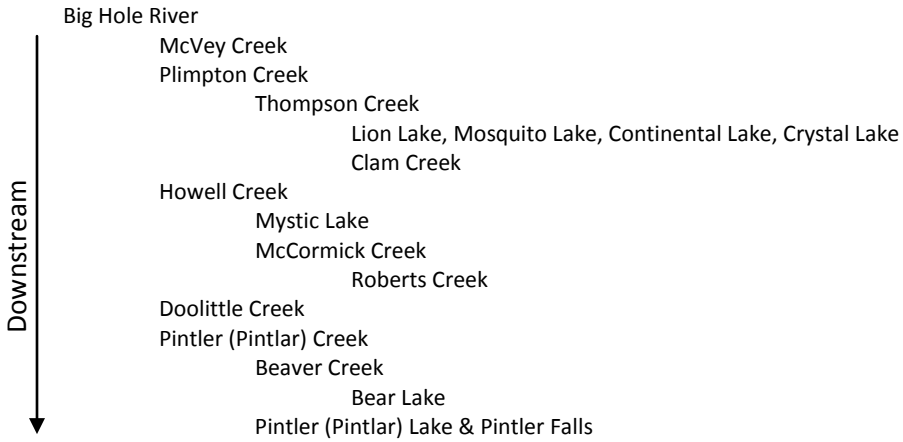
303d Listed Streams: McVey Creek, Pintler (Pintlar) Creek

Area: 217.9 square miles *Hydrologic Unit Code:* 1002000406

HUC 6 Watersheds within the Squaw Creek watershed:

- McVey Creek: 15.1 square miles
- Howell Creek: 21.0 square miles
- Plimpton Creek: 47.0 square miles
- Doolittle Creek: 22.4 square miles
- Pintler Creek: 29.7 square miles
- Squaw Creek: 21.0 square miles
- Mudd Creek: 15.9 square miles
- Big Hole River - Squaw Creek: 45.9 square miles

Tributaries:



Major Infrastructure: Highway 43

High Priority Abandoned Hardrock Mine: Wisdom (headwaters of Steele, Doolittle, McVey, Sane, Sheep Creeks & Fox Gulch) - Gold & Silver

TMDL Recommendations:

- *Doolittle Creek Sediment Load Reduction:* Current load = 1,292 tons/day. TMDL Sediment Load reduction 26%.Top ranked remedy is "eroding banks needing sustainable riparian zone vegetative condition" *Source:* (Montana DEQ, June 2009) - *Table 10-1*
- *McVey Creek Sediment Load Reduction:* Current load = 1,754 tons/day. TMDL Sediment Load reduction 31%.Top ranked remedy is "eroding banks needing sustainable riparian zone vegetative condition" *Source:* (Montana DEQ, June 2009) - *Table 10-1*

USFS Fish Key Watersheds: Plimpton Creek, Doolittle Creek, Squaw Creek

BLM Allotments: Doolittle Tracts #20196, Wildwood Individual #30250

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Montana Field Guide. (n.d.). *Westslope Cutthroat Trout — Oncorhynchus clarkii lewisi.* Retrieved 4 2, 2012, from Montana Natural Heritage Program and Montana Fish, Wildlife and Parks: http://fieldguide.mt.gov/detail_AFCHA02088.aspx

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Resources

Link Addresses

FWP	
Montana Field Guide Online - Montana FWP	http://fieldguide.mt.gov/statusCodes.aspx
Montana Statewide Fisheries Management Plan	http://fwp.mt.gov/fishAndWildlife/management/fisheries/statewidePlan/managementPlan.html
USFS	
Beaverhead Deer Lodge National Forest Plan	http://www.fs.usda.gov/detailfull/bdnf/landmanagement/planning/?cid=stelprdb5052938&width=full
Chapter 3: Forestwide Direction	http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5052768.pdf
BLM	
BLM Upper Big Hole Watershed Assessment	http://www.blm.gov/mt/st/en/fo/dillon_field_office/upperbighole.html
USFWS	
Candidate Conservation Agreement with Assurances for Fluvial Arctic Grayling in the Upper Big Hole River	http://www.fws.gov/mountain-prairie/species/fish/grayling/CCAA_June2006.pdf
DEQ	
303d lists on CWAIC	http://cwaic.mt.gov/query.aspx
Upper and North Fork Big Hole River Planning area TMDL and Framework	http://www.deq.mt.gov/wqinfo/TMDL/finalReports.mcpx
Conservation Groups & Related Non-Profit Organizations	
American Fisheries Society (AFS) Montana Chapter	http://www.fisheriessociety.org/AFSmontana/
American Rivers	http://www.americanrivers.org/
Arctic Grayling Recovery Program (AGRP)	http://www.fishhabitat.org/
Center for Biological Diversity	http://www.biologicaldiversity.org/species/fish/Montana_fluvial_Arctic_grayling/index.html
Big Hole River Foundation (BHRF)	http://www.bhrf.org/
Big Hole Watershed Committee (BHWC)	http://bhwc.org/
Ducks Unlimited, Inc.	http://www.ducks.org/
Missouri Headwaters Partnership (MHP)	http://mtwatersheds.org/Watersheds/WatershedGroups/MissouriHeadwatersPartnership.html
Montana Association of Land Trusts	http://www.montanalandtrusts.org/
Montana Audubon	http://www.mtaudubon.org/
Montana Land Reliance	http://www.mtlandreliance.org/
Montana Natural Heritage Program	http://mtnhp.org/
Montana Non-Profit Association (MNA)	http://www.mtnonprofit.org/
Montana Trout Unlimited (TU)	http://montanatu.org/
Montana Watershed Coordination Council (MWCC)	http://www.mtwatersheds.org/
Montana Wetlands Legacy Partnership	http://www.wetlandslegacy.org/
National Fish Habitat Action Plan	http://www.fishhabitat.org/
People and Carnivores	http://peopleandcarnivores.org/

Pheasants Forever - Beaverhead Chapter	http://montanapf.org/MTPF/mt-chapters/dillon-beaverhead-862/
Rocky Mountain Elk Foundation (RMEF) Montana	http://www.rmef.org/Conservation/WhereWeWork/Montana/
The Conservation Fund	http://www.conservationfund.org/
The Nature Conservancy (TNC)	http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/montana/placesweprotect/big-hole-valley.xml
The Trust for Public Land	http://www.tpl.org/
Western Native Trout Initiative	http://www.westernnativetrout.org/
Wildlife Conservation Society (WCS)	http://www.wcs.org/
Wildlife Society - Montana Chapter	http://joomla.wildlife.org/Montana/
Agencies	
Montana Bureau of Mines & Geology (MBMG)	http://www.mbmg.mtech.edu/
Montana Department of Environmental Quality - Water Quality Bureau (MDEQ)	http://www.deq.mt.gov/wqinfo/default.mcpx
Montana Department of Natural Resources & Conservation (DNRC)	http://dnrc.mt.gov/
Montana Department of Transportation	http://www.mdt.mt.gov/
Montana Fish, Wildlife & Parks	http://fwp.mt.gov/
Natural Resources Conservation Service (NRCS)	http://www.mt.nrcs.usda.gov/
US Forest Service Beaverhead Deer Lodge National Forest - Wisdom Ranger District (USFS)	http://www.fs.usda.gov/wps/portal/fsinternet/!ut/p/c5/04_SB8K8xLLM9MSSzPy8xBz9CP0os3gjAwhwtDDw9_AI8zPwhQoY6IeDdGCqCPOBqwDLG-AAjgb6fh75uan6BdnZaY6OiooA1tkqlQ!!/dl3/d3/L2dJQSEvUUt3QS9ZQnZ3LzZfMjAwMDAwMDBBODBPSEhWTjBNMDAwMDAwMDA!/?ss=110102&navtype=forestBean
US Bureau of Land Management - Dillon Field Office (BLM)	http://www.blm.gov/mt/st/en/fo/dillon_field_office.html
US Fish & Wildlife Service - Partners Program	http://www.fws.gov/partners/
US Geological Survey (USGS)	http://www.usgs.gov/
USGS Climate Change Center	https://nccwsc.usgs.gov/
Local Government & Conservation Districts	
Beaverhead County	http://www.beaverheadcounty.org/
Educational Institutions	
University of Montana Western Environmental Studies & Biology Programs	http://www.umwestern.edu/
Montana Tech	http://www.mtech.edu/
University of Montana	http://www.umt.edu/future.aspx
Avian Science Center	http://avianscience.dbs.umt.edu/default.php
Montana State University	http://www.montana.edu/
Montana State Fisheries Cooperative Unit	http://www.montana.edu/mtcfru/