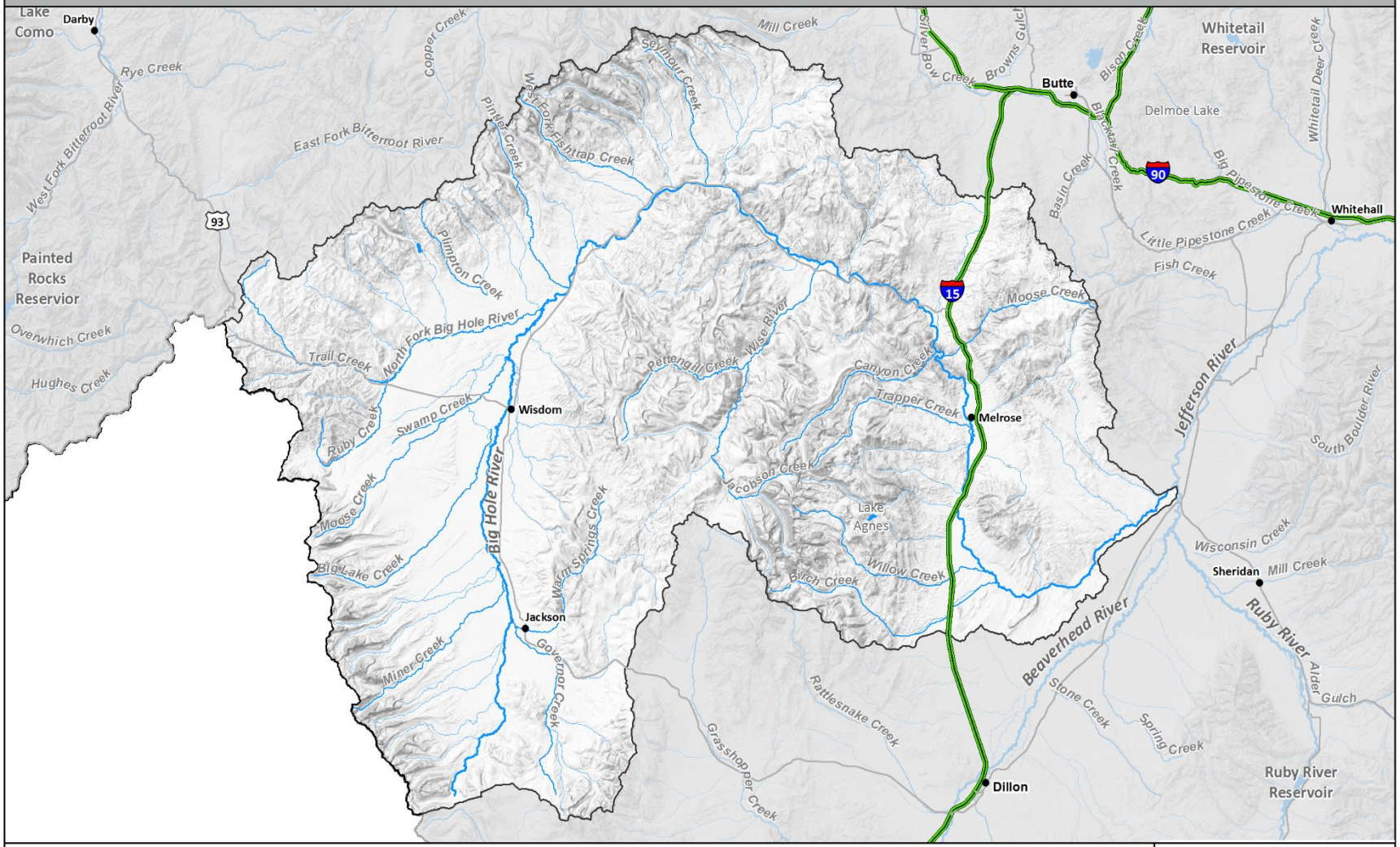
Big Hole River Drainage

MONTANA FWP



Drainage Boundary

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Area of Interest

Map Produced by:
ASP - Geographic Data Services
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Administrative boundaries and FWP Lands data from Montana Fish, Wildlife & Parks, Helena, MT. Background Imagery from ESRI

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Big Hole River Drainage

General Description

The Big Hole River originates in the outlet of Skinner Lake at an elevation of 7,340 feet in the Beaverhead Mountains of southwest Montana. From its modest beginnings, the river gathers volume and velocity due to numerous tributaries along its 115-mile course until its confluence with the Beaverhead River near Twin Bridges at an elevation of 4,600 feet. The Big Hole drainage encompasses about 2,476 square miles. The river drains the Beaverhead Mountains on the west and the south side the Anaconda-Pintler Range on the north. The river also collects water from the East and West Pioneer Mountain ranges. The average annual discharge of the river recorded at Melrose since the early 1900s is 1,117 cfs. The river is not dammed but a small hydroelectric dam was constructed on the river upstream of the town of Divide in 1900. The site was abandoned after flooding damaged the dam, but remnants of the structure and associated powerhouse remain, and an FWP fishing access site (FAS) bears the name of the historical site. Significant attempts were made in the 1960s to construct a dam downstream of Glen at the "Notch", but these efforts were thwarted due in large part to sportsmen who argued for benefits of a free-flowing river. From the high mountain meadows of its headwaters to the cottonwood bottoms of the lower river, the Big Hole is free-flowing and one of the most scenic rivers in Montana.

Major tributaries to the Big Hole River include the Wise River and the NF of Big Hole River. There are 137 named mountain lakes in the drainage, including low-elevation lakes such as Mussigbrod, Miner, Twin and Pintler lakes, which are accessible by vehicle and primarily support native fisheries. Outdoor recreation and angling are important activities that occur in the Big Hole. The river receives significant angling pressure, particularly in the middle and lower reaches. Angling pressure on the Big Hole was consistent from the late 1970s until 1999 at roughly 68,000 angler days per year but has increased steadily to over 118,000 in 2020. Several commercial fishing outfitters from Butte, Dillon, Twin Bridges, and Ennis frequent the Big Hole and contribute to the local economy.

Because of the importance of irrigated agriculture in the valley, the river and many of its tributaries can become dewatered. Additionally, the city of Butte pumps much of its drinking water from the drainage across the Continental Divide for municipal use. To address the impacts of periodic drought on the river, the Big Hole Watershed Committee developed the Big Hole River Drought Management Plan in 1997 and revised several times since its creation. The drought plan is based on a shared sacrifice model where ranchers and anglers both sacrifice for the health of the river when drought conditions prevail. This means that water users are asked to reduce withdrawals and anglers are restricted or rivers are closed to angling to reduce impacts to fish. The drought plan is reviewed annually, and any proposed changes are made by consensus of the group. FWP serves as an advisor on this committee and frequently proposes modifications to the plan. FWP follows the drought plan when implementing drought-related angling restrictions or closures.

Dividing larger ranches into small parcels and subdivisions, particularly in the middle and lower reaches of the river, has become common in the Big Hole drainage. Such developments cause concern for the fishery and the natural river functions that support it because structures are being constructed within the channel migration zone of the river. Special ordinances and development setbacks have been

adopted by the four counties within the Big Hole River drainage to limit development within 150 feet of the river.

In recent years, interest in protecting the Big Hole River, the pristine nature of the valley, its fishery, and the way of life of the people that call the valley home has increased. Groups such as the Big Hole Watershed Committee, the Big Hole River Foundation, and others have collaborated with government agencies, ranchers, sportsmen, and other groups to develop conservation plans and complete projects that protect and restore the natural resources of the Big Hole. Some of these major accomplishments include the Big Hole River Drought Management Plan, Arctic grayling habitat restoration, creation of the Candidate Conservation Agreement with Assurances (CCAA) in the upper Big Hole, and improvements in irrigation efficiency. These groups have been highly successful at using collaboration to accomplish common conservation goals.

Recently, significant restoration projects have been completed in tributaries of the Big Hole River, French Creek in particular. French Creek has an extensive mining history. Several streams including French Gulch, First Chance, Panama, California and the mainstem creek have been placer mined. Atmospheric deposition of heavy metals and other harmful substances have significantly degraded upland vegetation in the upper parts of California Creek, which has increased the amount fine sediments in the stream. Millions of dollars have been spent in this drainage in the past 10 years to restore the impacts of these past actions.

Fisheries Management

The Big Hole is a premiere trout fishery and its trout population trends are closely monitored. Native fish in the Big Hole River include westslope cutthroat trout, Arctic grayling, mountain whitefish, white sucker, longnose sucker, mountain sucker, Rocky Mountain sculpin, longnose dace, and burbot. The mainstem river also supports nonnative fishes common to southwestern Montana including rainbow trout, brown trout, and brook trout. Mountain whitefish, native suckers, and minnows are common, but cutthroat trout and Arctic grayling are rare. Brook trout are ubiquitous in the tributaries and have nearly replaced native cutthroat trout. However, brook trout are becoming increasingly rare in the upper Big Hole River upstream of Wisdom because of an expanding population of brown trout. The upper Big Hole River drainage contains one of the last fluvial Arctic grayling populations in the lower 48 states. Active conservation programs are ongoing to enhance habitats in the Big Hole River and its tributaries. Mussigbrod, Miner, and Pintler lakes have self-sustaining populations of native Arctic grayling. Burbot are common in the upper and middle Big Hole River, some tributaries, and low elevation lakes. Twin Lakes has a native population of lake trout; one of only six lakes in Montana with native lake trout. There are 106 mountain lakes in the Big Hole drainage that contain rainbow trout, brook trout, Yellowstone cutthroat trout, westslope cutthroat trout, golden trout, Arctic grayling, Rocky Mountain sculpin, and longnose sucker. The Big Hole River and its tributaries are managed as wild trout fisheries, meaning that fish that live in the river are naturally reproduced and not stocked with hatchery-reared fish. The current wild trout management strategy replaced hatchery-based management of trout about 50 years ago. Maintenance of healthy fish habitats for all life stages is imperative for this strategy to succeed and has proven to be a highly effective approach for managing high-quality and resilient fisheries across the state.

Maintaining stream flows is key to wild fish management. In the Big Hole this has been a major focus of the Big Hole Watershed Committee and the drought plan has been successful at improving flows during drought conditions. Wild fish management in the Big Hole also relies on habitat protection and restoration of spawning and rearing habitats in the mainstem river and tributaries. Habitat protection is accomplished, in part, through FWP's involvement in stream permitting. Any project that affects the bed or banks of a stream or river, whether from a private individual or a government agency, requires a permit from a local conservation district (310 permit) or FWP (124 permit). FWP plays a pivotal role in each of these permitting processes to ensure that impacts to aquatic habitat are minimized. FWP also works to maintain connectivity between tributary streams. Tributaries are vital because of the water they supply and the habitat they provide for supporting natural reproduction and rearing habitat for juvenile trout. Habitat restoration projects occur where habitat has become degraded or where key habitat, such as spawning habitat, is lacking. FWP works closely with partner groups such as the Big Hole Watershed Committee in developing and implementing habitat restoration projects. Lastly, wild fish management requires fishing regulations to be established in such a way that reproduction can offset angler harvest and natural mortality.

Wild fish management is monitored through annual population estimates from electrofishing surveys. Four long-term monitoring sections exist in the Big Hole River: Jerry Creek (Jerry Creek Access to George Grant Memorial FAS), Melrose (Salmon Fly FAS to Brownes Bridge FAS), Hogback (Glen FAS to Tony Schoonen FAS), and Pennington (Pennington Bridges to High Road Bridge). Monitoring at the Melrose section has generally occurred annually and has the longest period of record (1969 to present). The Jerry Creek and Hogback sections have been monitored on a biannual basis for the past 10 years but were previously monitored annually. The Pennington Section, which is monitored biannually, was established in 2009. In addition to trout monitoring, mountain whitefish population estimates have been completed periodically in the Jerry Creek, Melrose, and Pennington sections.

Brown trout abundances at all monitoring sites, except for Pennington, are at all-time lows. For reasons that are not entirely clear, the brown trout population has been declining for the past seven years. Similar declines have been noted in other southwest Montana rivers. Although water quantity is clearly the main driver of trout abundance in the Big Hole and across Montana, other factors are also thought to be responsible for recent brown trout declines. Rainbow trout trends across the river are relatively stable. Rainbow trout typically average roughly 30% of the trout population in the Big Hole, but with recent declines in brown trout, rainbow trout are roughly 50% of the trout found in the river.

The Big Hole River is one of the most heavily fished waters in southwest Montana, with only the Madison River and Yellowstone River receiving more angling pressure. Angling pressure estimates on the Big Hole show that fishing pressure has increased from roughly 50,000 angler days per year in the 1980s to over 118,000 angler days in 2020. The only declines in pressure on the Big Hole in this time period, were observed when the river was closed to angling in the summer due to low flows as outlined in the drought plan.

The history of fishing regulations on the Big Hole River are complicated and diverse. In 1981, the Big Hole River from Divide to Melrose was placed under special regulations including a slot limit that required anglers release trout from 13- to 22-inches while allowing harvest of 3 fish less than 13-inches and 1 fish over 22-inches. Angling gear was also restricted to flies and artificial lures within this reach. The remainder of the river upstream and downstream of this reach remained under the Central Fishing

District standard limit of 5 fish with only 1 fish over 18-inches. In 1986 the same regulations as previously adopted for the Divide to Melrose reach were adopted from Dickie Bridge to Divide, which were followed by increased trout abundances. The slot limit for trout was eliminated in the early 2000s, but the artificial lures regulation remained. No trout could be harvested from the confluence with the Beaverhead River to Dickie Bridge from December 1 through the third Saturday in May. However, an extended season existed for whitefish during the winter. To protect Arctic grayling in the upper river, trout harvest was allowed year-round upstream of Dickie Bridge to encourage harvest of non-native species. In 2021, in response to declines in brown trout abundance, new regulations were adopted which included catch-and-release for brown trout for the entire river downstream of Dickie Bridge and a seasonal closure to all angling from Bureau of Land Management's (BLM) Maiden Rock site to Brownes Bridge FAS (15.6 miles of river) was adopted from October 1 to April 1 to protect brown trout from angling pressure during spawning and prevent disturbance of incubating eggs deposited in redds. Gear restrictions were also adopted from Dickie Bridge to the confluence with the Beaverhead River, which include only single hook artificial flies and lures (i.e., no treble or double hooks).

In addition to the mainstem river, nearly 2,000 miles of tributaries in the Big Hole drainage support fish. Those streams are managed as wild fisheries and are a relatively untapped resource. Brook trout are found in every tributary of the Big Hole River and typically the most common salmonid in each stream. Brook trout populations tend to be prolific, so liberal harvest regulations were established to promote harvest, which will often result in a better-quality brook trout fishery. Recently, brown trout are becoming more common in tributaries as well. Many tributaries that are well connected to the mainstem Big Hole River are important for fluvial fish. Fall (e.g., brown trout) and spring (e.g., Arctic grayling, rainbow trout) spawning fish migrate into some of these tributaries to reproduce. The young trout and grayling stay for months to years before migrating back to the Big Hole. Arctic grayling are also known to seek out these cold tributaries in the summer when river conditions become warm and low. Monitoring of most tributary fisheries occurs periodically, with some streams sampled infrequently due to minimal angling pressure or threats to important habitats.

A few streams in the Big Hole drainage are managed specifically for native westslope cutthroat trout. These streams generally have extant cutthroat trout populations, and some have natural or manmade fish barriers that preclude upstream fish passage.

There are 106 lakes in the Big Hole drainage that contain fish. Many of the high elevation lakes in the drainage were likely historically fishless due to barriers preventing fish from moving upstream. However, fish were stocked into many lakes beginning in the early 1900s. Stocking of mountain lakes in the Big Hole still occurs in 33 lakes that do not support adequate natural reproduction to sustain a fishery while the rest are maintained through natural reproduction. Stocking in alpine lakes is performed primarily using a helicopter and generally occurs at 4-year intervals at densities of about 100 fish/acre. The density and frequency of stocking is adjusted based on the productivity of each lake and angling pressure. Prior to 2006, Yellowstone cutthroat trout was the primary species stocked into mountain lakes, but since then native westslope cutthroat trout have been stocked because they provide a similar angling experience and are native to the area. Further, recent studies have shown that westslope cutthroat trout stocked in several mountain lakes in the Big Hole grow faster than Yellowstone cutthroat trout. In general, stocked lakes provide the highest quality fisheries in Big Hole lakes for larger, healthier trout. The reason for this is that trout densities can be controlled through stocking whereas lakes that support natural reproduction tend to overpopulate leading to reduced growth and maximum sizes. Of

the self-sustaining lakes that do not require stocking, there are 32 lakes that support Yellowstone cutthroat trout populations, 23 that contain rainbow trout, 13 that contain brook trout, and the remaining lakes have a combination of cutthroat, rainbow, and/or brook trout. Three alpine lakes in the drainage support conservation populations of Arctic grayling. Two additional lakes are stocked with golden trout every six years.

Five lower elevation lakes exist in the Big Hole drainage on U.S. Forest Service (USFS) lands which are accessible by vehicle and support fisheries: Pintler, Mussigbrod, Twin, Miner and Van Houten lakes. These lakes have primarily native fisheries, and all have developed USFS campgrounds. Except for Twin Lakes, all have native populations of Arctic grayling. Brook trout are present in the lakes but are a minor component of the fisheries. Van Houten Lake is stocked with grayling of Big Hole ancestry to maintain a sport fishery. Restoration was completed at Van Houten Lake to create self-sustaining cutthroat trout and grayling populations, but grayling reproduction has yet to be documented. Despite a lack of reproduction, Van Houten Lake provides an excellent fishery for cutthroat trout and grayling. Twin Lakes is home to a native population of lake trout and is only one of six lakes in Montana to support native lake trout. Burbot are present in all the lakes except Van Houten Lake.

Habitat

Water availability is the primary limiting habitat factor for the fishery in the Big Hole River and its tributaries. Withdrawals for irrigation and municipal use within the Big Hole River drainage can cause periods of low flow and high water temperatures, which can be stressful to fish. Sections of the river are listed as impaired by Montana Department of Environmental Quality (DEQ) because of high stream temperatures. Irrigation practices can also lead to reduced habitat connectivity (channel-wide pin and plank diversions that block fish passage and/or dry stream channels) and entrainment (loss of fish in irrigation ditches). To address low flows and high temperatures, the Big Hole Watershed Committee, working cooperatively with water users and FWP, has adopted a voluntary drought management plan with specific streamflow and temperature triggers. The goal of the plan is to maintain minimum flows and requests water users to voluntarily reduce withdrawals from the river. Multiple drought management sections exist on the Big Hole River with specific flow and temperature triggers. Water users are asked to reduce their water use and angling is restricted when those triggers are met. Those currently enrolled in the CCAA and have completed an approved site-specific plan in the upper Big Hole Valley are required to comply with reductions in diversions as stated in each individual plan. Landowners that have not completed site-specific plans reduce irrigation diversions on a temporary agreement until the site-specific plan is completed or approved. The reduction in water use by irrigators and municipalities has resulted in increased river flows during drought conditions. For example, in 1988 the Big Hole River at Wisdom was completely dry for 24 days, whereas in a similar precipitation year in 2021 the river never went dry. Similarly, farther downstream at Melrose the minimum flow in the Big Hole River in 1988 was 53 cfs, but in 2021 the minimum flow was 138 cfs.

Land management activities in the Big Hole River basin, including mining, logging, irrigation, grazing, and stream straightening, have degraded water quality and quantity, stream form and function, as well as riparian habitats. Because the Big Hole River flows primarily through private land, cooperative habitat improvement projects with landowners are essential to improving fisheries habitats. Over 450 habitat improvement projects have been completed on private land in the Big Hole Valley as part of the CCAA. Those projects have been focused primarily in the upper valley and improved riparian health, instream

flows, and habitat connectivity as well as reduced or eliminated entrainment. Grazing and instream flow agreements surrounding the Big Hole River and its tributaries have improved riparian habitats and stream flows, especially during spawning seasons and when baseflows are typically lowest. Replacing nonfunctioning irrigation infrastructure and installing fish ladders or screens have improved irrigation efficiency, increased habitat connectivity, and reduced entrainment.

Streambank stabilization has significantly altered the function of the lower river, particularly downstream of Notch Bottom, and remains a significant threat to river function. In areas of the lower river with a wide floodplain, the river is prone to natural channel migration and channel avulsions, which help to create new channels. These natural channel changes are important in maintaining aquatic habitats in these types of rivers. However, bank stabilization is often proposed when these channel changes threaten irrigation water withdrawals, surrounding agricultural lands, or nearby structures. Groups such as the Big Hole Watershed Committee and county governments are seeking a collaborative approach to ensuring natural river function and responsible development of the Big Hole Valley. The Big Hole was one of the first rivers to have a set-back rule where no structures could be built within 150 feet of the river in all four counties in the drainage. Further collaborative efforts are being made to better understand the floodplain of the river and guide future development in these areas.

The lower river from Notch Bottom to the confluence with the Beaverhead River is a focus area for FWP with the hope of improving habitat and flows to benefit the fishery. The density of trout in this reach has historically only been half of that present in the river 10 miles upstream. Limited spawning and rearing habitats and low summer flows due to irrigation withdrawal are the primarily factors limiting the trout populations in this reach. The lack of spawning and rearing areas are likely due to the lack of tributaries in this reach and the bank stabilization completed over the past 70 years. Bank stabilization in this reach simplifies channel complexity, slows channel migration, and inhibits the creation and maintenance of side channels. Side channels are important spawning and rearing areas because they often contain complex habitats with log jams and other structures used by juvenile fish. They also contain smaller substrates suitable for spawning. Habitat restoration was completed in Smith Slough in 2017 within this reach of river. Working cooperatively with the private landowners, nearly two miles of slough channel were enhanced and over 2,000 feet of spawning habitat was created. Subsequent monitoring indicates brown trout and rainbow trout use the slough for spawning and rearing. It is possible that the restoration of these habitats has increased resiliency of the fishery in the lower river as brown trout declines in this reach have been less severe than farther upstream. Also, efforts are underway to work cooperatively with landowners and irrigators and the Big Hole Watershed Committee to increase flows during summer to benefit the fishery.

Special Management Issues

Arctic Grayling Conservation

The primary management objective in the Big Hole River upstream of Dickie Bridge is the conservation of the last native, fluvial population of Arctic grayling in the lower 48 states. Therefore, no harvest of Arctic grayling is permitted within the Big Hole River or any of its tributaries. Additionally, the seasons and bag limits for non-native trout are liberalized to encourage harvest, particularly that of brown trout.

A decline in the abundance and distribution of grayling in the 1980s increased efforts to understand population dynamics, identify critical habitats, and implement conservation projects to address factors limiting the population. Those efforts led to the creation of the Arctic Grayling Recovery Program (AGRP) and eventually the CCAA for Fluvial Arctic Grayling in the Upper Big Hole River. The Big Hole CCAA was developed to help alleviate concerns of private landowners that could be affected by the potential Environmental Site Assessment (ESA) listing of Montana grayling and to generate support from private landowners to proactively improve habitat conditions for grayling throughout the Big Hole CCAA project area. The project area includes the Big Hole River watershed upstream of Dickie Bridge. Under this agreement the U.S. Fish & Wildlife Service (USFWS) gave FWP the authority to enroll nonfederal landowners within the project area. Thirty-one nonfederal landowners are enrolled and provided incidental take coverage and regulatory assurances once they sign a Certificate of Inclusion and a site-specific conservation plan for their property. Site-specific conservation plans are developed by an interdisciplinary technical team consisting of individuals representing the Big Hole CCAA partnering agencies (FWP, Montana Department of Natural Resources and Conservation (DNRC), Natural Resources Conservation Service (NRCS), and USFWS). Conservation measures outlined in the Big Hole CCAA are addressed in each site-specific plan by implementing actions that: 1) improve stream flows; 2) improve and protect the function of riparian habitats; 3) reduce or eliminate entrainment threats to grayling; and 4) remove barriers to grayling movements.

In 2007, FWP, BLM, USFWS, USFS, Montana Council Trout Unlimited, Montana Chapter American Fisheries Society, Yellowstone National Park, Montana Arctic Grayling Recovery Program, NRCS, and DNRC all signed a MOU Concerning Montana Arctic Grayling Conservation, which was renewed in 2018. This MOU defines conservation responsibilities and procedures agreed to by signatory agencies that benefit Arctic grayling. Additionally, in 2022 a Conservation Strategy was developed by FWP for grayling with objectives and goals for grayling in the upper Missouri River system including the Big Hole drainage. The objectives of grayling management in the Big Hole River are to maintain a stable or increasing population in the mainstem, as well as maintain populations in Miner, Mussigbrod, and Pintler lakes.

Because grayling in the Big Hole River are rare, have a wide distribution, and spawn in multiple locations, it is not effective to conduct standard population estimates as done with other fish. Since 2006, FWP uses genetically based monitoring techniques to determine population trends. Long-term trends show that the population increased by about 162% since the CCAA program began. Additionally, fall sampling in 2021 documented young-of-year (YOY) and adult grayling at nearly all sampling sites despite extreme drought and historically low runoff. The increases in grayling abundances observed over the past decade are attributed to improved stream flows, habitat, temperatures, and connectivity.

Due to increased brown trout distribution and abundance in the upper Big Hole River and the potential impact they could have on Arctic grayling, additional trout population monitoring sections should be considered. Management actions to enhance and restore grayling in the Big Hole River over the next four years will continue to focus on the standard CCAA habitat enhancements. Specific emphasis will continue to be placed on upgrading diversions along the Big Hole River with screw gates to improve efficiency of irrigation withdrawals and instream contributions to improve instream flows. Additional emphasis for irrigation infrastructure and efficiency will be placed on streams with significant grayling spawning and rearing habitats followed by all other tributaries within the Big Hole CCAA. When possible, grade control structures and step pools will be used to improve fish passage over conventional fish ladders for diversions that are barriers to fish passage for irrigation infrastructure projects.

Riparian habitat projects will primarily focus on soft restoration techniques that improve instream and riparian habitats for grayling. Those efforts will be prioritized on the following streams for grayling: Big Hole River, Governor Creek, Englejard Creek, Swamp Creek, NF of the Big Hole River, and Fishtrap Creek. Riparian pasture fencing will also be prioritized in the Big Hole River from Wisdom Bridge to Dickie Bridge.

Stock water systems that improve riparian health and instream flows will play a significant role in the projects completed over the next four years. Following 2021, the lack of sufficient stock water systems on enrolled lands was identified as a limiting factor for improving instream flows later in the season. In response, the CCAA agencies developed two Targeted Implementation Plans (TIPs) that were successfully funded for the next five years to cover these projects by the NRCS. Between 15 and 30 new stock water systems will be installed by 2026.

One entrainment project has been identified within the Big Hole CCAA to be completed by 2023, which will be completed on Daniels Ditch.

Big Hole River Adaptive Trout Management

The middle and lower reaches of the Big Hole River downstream of Dickie Bridge are managed with the objective of providing a quality angling experience for brown trout and rainbow trout. Recent declines in brown trout abundance coupled with increased fishing pressure and continued environmental limiting factors has led to increased interest in modifying fishing regulations based on fish population trends. From that interest, FWP worked with a variety of river interests to develop an adaptive plan for Big Hole fishing regulations.

This adaptive plan divides the lower river into three sections based on habitat and fisheries characteristics and management objectives. The upper reach from the headwaters downstream to Dickie Bridge is managed with the primary objective of conserving Arctic grayling. The river valley is wide in this area and the river is generally shallow and low gradient. Trout densities in this reach are generally low and this reach of river has liberal trout limits to encourage trout harvest to aid in the conservation of Arctic grayling. There are no specific trout population-based objectives in the upper river. The middle management reach is from Dickie Bridge to Brownes Bridge. The habitat in this canyon reach is characterized generally by large substrate size and a constrained floodplain. The lower management reach is from Brownes Bridge to the confluence with the Beaverhead River and this section of river has a much wider floodplain with a robust cottonwood forest. The river tends to migrate across the floodplain in this reach with frequent natural channel changes. Late season flows are generally less in the lower reach as there are more irrigation withdrawals and fewer tributary streams adding water to the river. The lower two management sections of the Big Hole River receive most of the fishing pressure.

The population objectives for the middle reach from Dickie Bridge to Brownes Bridge were determined from roughly 30 years of data from the Melrose monitoring section. Population estimates are conducted annually and used according to the objectives below to recommend fishing regulations. Recommended gear restrictions for this entire section of river would be artificial flies and lures only (this section has had a gear restriction since 1981). Ideal trout densities for this section are between the 25th (1198 trout/mile) and the 75th percentile (1698 trout/mile, Figure 2.14-1). Within this range, fish condition and growth are maximized while in balance with a moderate fish density that produces good angler

catch rates. When the fish population is within this range in a regulation change year, a 5 combined trout limit with no fish over 18-inches would be recommended (Table 2.14-1). If fish densities decline between the 5th and 25th percentiles (between 806 and 1198 trout/mile) in the regulation cycle year, recommended regulations will be 1 trout daily under 18-inches with a full angling closure from October 1 to April 1 to protect spawning brown trout and their incubating eggs (Table 2.14-1). The intent of these restrictions are to reduce potential angling related morality on fish and incubating eggs and increase trout abundance to the management objective. If the fish population falls below the 5th percentile (806 trout/mile), recommended regulations will be catch-and-release for all trout and a full angling closure from October 1 to April 1 (Table 2.14-1). This recommended regulation change would be sought as soon as possible to minimize impacts of angling. If abundance increases above objective between the 75th and 95th percentiles (1698 to 2212 trout/mile) in a regulation year, the recommended daily limit will increase to 7 fish/day with none over 18-inches to reduce abundance to within optimal range (Table 2.14-1). If the population exceeds the 95th percentile (2212 trout/mile) the recommended daily limit will increase to 10 fish/day with no fish over 18-inches to encourage the harvest of smaller fish (Table 2.14-1), which should slowly reduce trout abundances and minimize the potential for a population crash. To corroborate trends observed in the Melrose monitoring section, trout populations in the Jerry Creek monitoring section upstream will be monitored biannually.

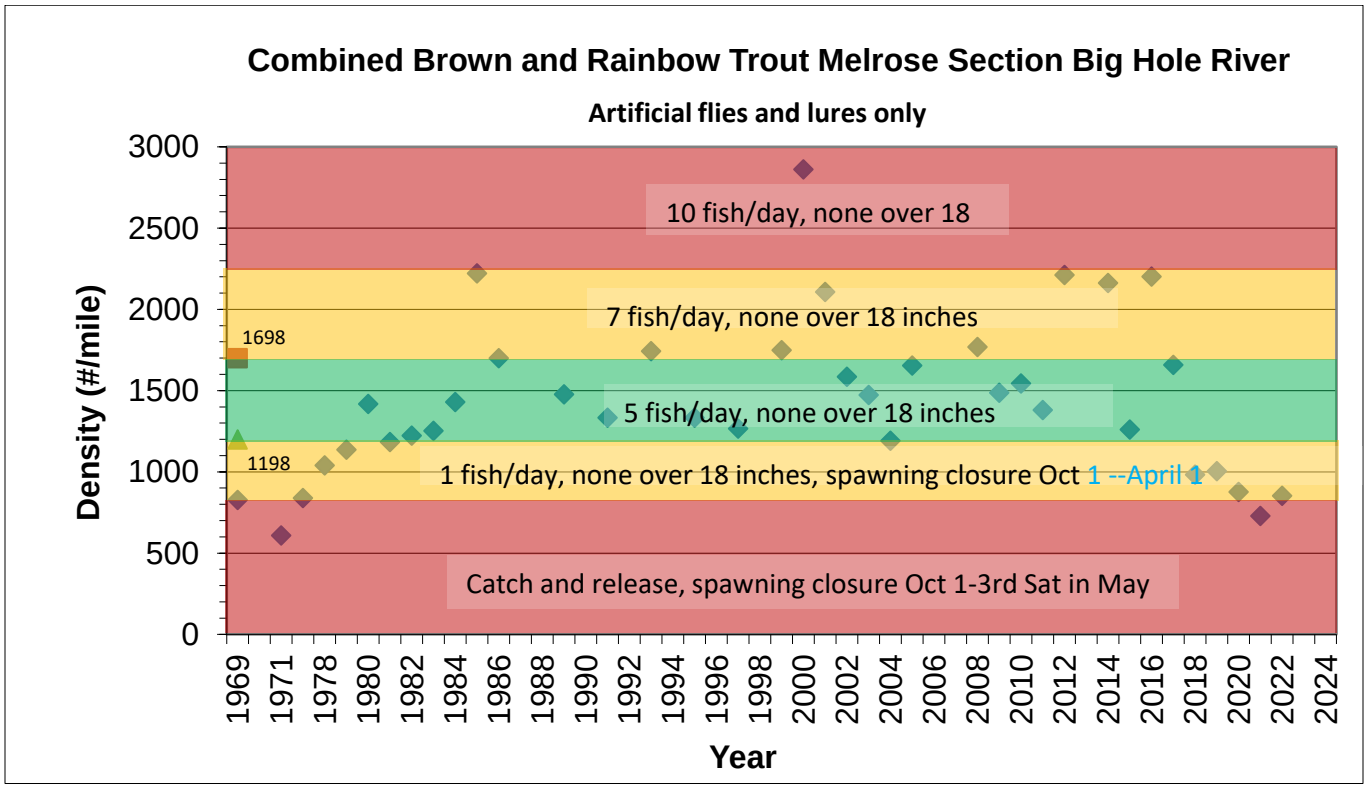

Figure 2.14-1. Combined trout abundance estimates for brown trout and rainbow trout in the Melrose Section from 1969 to 2022. Red areas represent the <5th and >95th percentiles. Yellow areas are the <25th and >75th percentile and green indicates the ideal trout density range between the 25th and 75th percentiles. More liberal regulations are proposed when the population is over objective and more restrictive regulations are proposed when the populations is below objective.

Table 2.14-1: Recommended harvest limits based on population trends for the Big Hole River from Dickie Bridge to Brownes Bridge. Gear restrictions and no fish over 18-inches would remain in place for the entire lower river.

	0 to 5th Percentile	**5th to 25th Percentile**	**25th to 75th Percentile**	**75th to 95th Percentile**	**95th Percentile and above**
Combined Trout	Catch-and-release, angling closure Oct 1 to April 1	1 fish daily and in possession none over 18 inches, angling closure Oct 1 to April 1	5 fish daily and in possession, none over 18 inches	7 fish daily and in possession, none over 18 inches	10 fish daily and in possession, none over 18 inches

In the lower river section from Brownes Bridge to the confluence with the Beaverhead River, regulation changes will be based on combined trout density at the Hogback monitoring section. Abundance estimates will be collected annually in this section. If population abundance is within the 25th and 75th percentiles (1064 to 1520 trout/mile, Figure 2.14-2) for combined trout density at the beginning of a regulation cycle, a combined 5 trout daily limit with no fish over 18 inches would be recommended. If the fish population declines between the 5th and 25th percentiles (727 to 1064 trout/mile) in a regulation cycle year, recommended regulations will be 1 trout/day under 18 inches with a full angling closure from October 1 to April 1 to protect spawning brown trout and their eggs incubating in the gravels (Table 2.14-2). If the fishery declines below the 5th percentile (727 trout/mile), recommended regulations include catch-and-release only for all trout and a seasonal closure from October 1 to April 1 (Table 2.14-2). These regulation changes will be sought as soon as possible. The recommended daily limit will be 7 fish per day with none over 18 inches when combined trout abundances are between than the 75th and 95th percentiles (1520 to 1942 trout/mile) in a regulation cycle year (Table 2.14-2). If abundance exceeds the 95th percentile (1942 trout/mile) the harvest limit will be increased 10 fish/day with no fish over 18 inches to encourage the harvest of smaller trout (Table 2.14-2). The annual population estimates collected at the Hogback monitoring section will be corroborated with data collected biannually at the Pennington monitoring section located farther downstream.

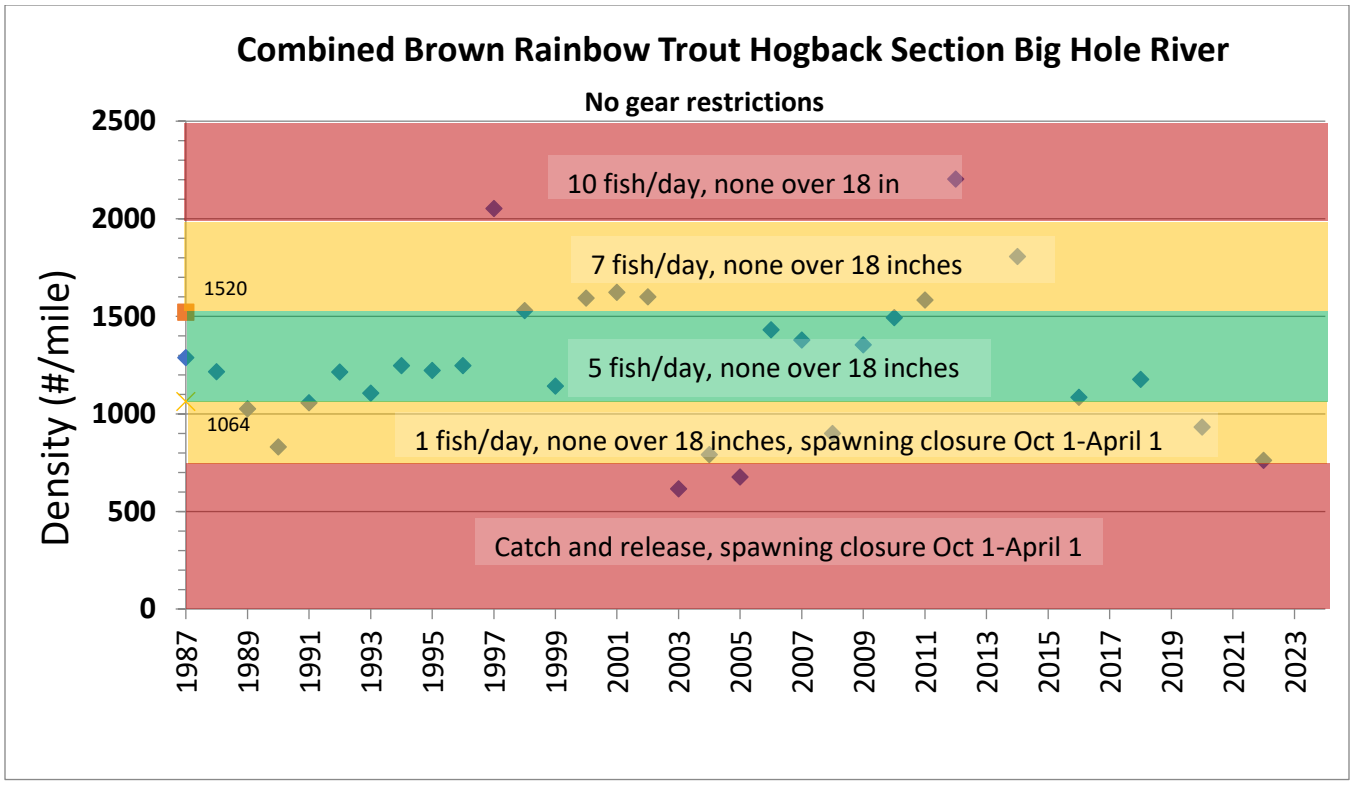

Figure 2.14-2. Combined brown trout and rainbow trout abundance estimates in the Hogback Section from 1987 to 2022. Red areas are the <5th and >95th percentiles. Yellow areas are the <25th and >75th percentile and green indicates the ideal trout density range between the 25th and 75th percentiles.

Table 2.14-2: Recommended harvest limits based on population trends from Brownes Bridge to the confluence with the Beaverhead River. Gear restrictions and no fish over 18 inches would remain in place for the lower river.

	0 to 5th Percentile	**5th to 25th Percentile**	**25th to 75th Percentile**	**75th to 95th Percentile**	**95th Percentile and above**
Combined Trout	Catch-and-release, angling closure Oct 1 to Apr 1	1 fish daily and in possession, none over 18 inches, angling closure Oct 1 to Apr 1	5 fish daily and in possession, none over 18 inches	7 fish daily and in possession, none over 18 inches	10 fish daily and in possession, none over 18 inches

Trout populations are influenced by a myriad of factors, just one of which may be angling. Data indicates that flow is one of the main drivers of fish densities, which decline during drought. In addition to water quantity, habitat, including water quality, is likely the second most important factor affecting trout densities. The management approach proposed herein attempts to limit the impacts of angling (either harvest, catch-and-release of spawning fish, and trampling impacts to incubating eggs) as trout populations fluctuate, but other factors are likely the main contributors. Overall, the impacts of angling on the trout of the Big Hole are poorly understood. Fish harvest and unintentional catch-and-release

mortality are not well documented. It has been decades since the last creel survey was completed on the Big Hole River. Those data may not be relevant because of changing angler demographics and increased pressure in recent years. A thorough creel survey and fish mortality study are needed to better understand the multiple facets of natural and angling related fish mortality. This information could help guide the proposed management plan, fishing regulations, and other potential projects to improve the fishery.

Spawning Habitat Projects

The creation of spawning habitat along the Big Hole River is a priority for habitat restoration. The Big Hole has relatively large substrates in certain reaches, which are not suitable for spawning redds. Small substrates typically used for spawning are more common in side channels, tributaries, and shallow, low-gradient riffles. Restoration of sloughs in the lower Big Hole River, which have spring flows, irrigation flows, and surface flows from the river, is proving successful at creating additional spawning areas. Restoration of these areas includes channel narrowing to facilitate fine sediment transport, which helps to increase the proportion of suitable sized spawning substrates. Ideal systems for spawning have flows of at least 5 cfs, and at least 0.5 miles of potential habitat. Additional opportunities for development of these sloughs for spawning should be pursued; however, nearly all opportunities are located on private properties downstream of the Wise River and would require the cooperation of landowners.

Connectivity of Tributary Streams

Tributary connectivity will be a priority for Big Hole River restoration over the next four years. Tributaries are the life blood of mainstem rivers as they provide critical spawning and rearing habitats for mainstem fisheries. Furthermore, most tributaries provide relatively cold water from high mountain ranges that help cool the mainstem river. Many tributaries are diverted for irrigation and are disconnected seasonally from the river because of dewatering or barriers created by impassible irrigation diversions. For example, an estimated 50 cfs of groundwater and surface runoff is produced from the Wise River drainage yet only 2 cfs makes its way to the Big Hole River because of water withdrawals, which makes fish passage nearly impossible into the Wise River. Increasing contributions from the Wise River could help offset the chronically warm waters of the Big Hole River. FWP is working with the Big Hole Watershed Committee to establish a Drought Management Plan with the irrigators on the Wise River. As the plan is developed habitat and infrastructure improvement projects will be identified to help better manage irrigation, improve instream flow, and improve fish habitat. Potentially significant improvements can be made in this system that could benefit the Wise River and the Big Hole.

Wise River and Tributary Flow Improvements

The Wise River area is a large source of cold water to the Big Hole River through surface and groundwater inputs. Improving late season flows in the Wise River would give access of fish to the Wise River during warm months. Additional habitat improvements in the Wise River could encourage fish to use the Wise River as thermal refuge. Irrigation practices could potentially be altered to use warm water in the Big Hole River and allow the cold water in the Wise River to reach the Big Hole. Similar opportunities are present on other smaller tributaries to the Big Hole to maintain year-round

connectivity between tributaries and the mainstem river. Consistent connectivity could be maintained with the Big Hole River while decreasing water temperatures in the river if such changes to irrigation practices could be implemented. Collaboration with irrigators and DNRC would be needed to make the necessary changes in water rights to implement those changes.

Elkhorn Creek Water Quality

Elkhorn Creek is tributary to David Creek, which drains into the Wise River. The Elkhorn Mine has an active adit drain and metals laden waste rock adjacent to the stream leaches heavy metals into Elkhorn Creek. The Big Hole Watershed Committee in cooperation with the USFS and FWP are working on a restoration plan to reduce the metals loading to Elkhorn Creek. The metals input from the mine form a chemical barrier to fish movement, and therefore, no brook trout exist upstream of the contaminated area. The westslope cutthroat trout in the stream above the mine potentially have high conservation value and restoration of the site should be completed such that hybridization risk of this population and invasion by brook trout are eliminated.

Irrigation Infrastructure Upgrades

Irrigation Infrastructure is a key component of habitat quality and drought management on the Big Hole River. Several irrigation diversions on the river require frequent maintenance, which usually involves the placing of equipment in the river and building up of gravel dikes to divert flows to headgates. Those disturbances cause increased turbidity and alter the configuration of the riverbed. Outdated or dilapidated headgates and diversion structures can also reduce an irrigator's ability to closely regulate irrigation flows. For example, several irrigation diversions lack functioning headgates so once the irrigation flows are turned on in the spring, they remain open at maximum capacity until the end of the irrigation season. Thus, when flows in the river recede, limited ability exists to closely regulate the amount of water diverted from the river. If these structures were updated, water users could cause less disturbance to river habitats and more closely regulate the amount of water they divert, which could increase flows in the Big Hole River, particularly during dry years.

Livestock Grazing Management

Grazing management on the public lands is a concern for stream management. Overgrazing can destabilize streambanks, widen stream channels, increase sedimentation, and degrade riparian habitats. Small streams in the Big Hole drainage have great fisheries value for native and non-native fish and can be significant contributors to mainstem fisheries. The USFS and BLM regulate grazing leases on their lands based on designated plans that include grazing standards. FWP has no regulatory role in grazing management on federal lands, but we can work with federal partners to help ensure grazing standards set forth in management plans are met and facilitate projects that reduce the impacts to grazing on fisheries.

Westslope Cutthroat Trout Conservation

The Big Hole drainage supports more conservation populations of westslope cutthroat trout (49) than any other drainage in the upper Missouri River basin. Populations exist in American, Bear, Bender, Big Lake, Blind Canyon, Bryant, Cherry, Doolittle, Dry, Gory, Governor, Halfway, Jacobson, Jerry, Johnson, Lacy, Lambrecht, Little American, Long Branch, McVey, Meadow, Mono, Moose, Mule, Mussigbrod, North Fork Divide, Odell, Pintler, Unnamed tributary to Pioneer , Plimpton, Rock (west Big Hole), Ruby, Schultz, Seymour, South Fork of North Fork Divide, Sixmile, Spruce, Squaw, Steel, Stine, Swamp (Wise River), Tenmile, Trapper, Twelvemile, Warm Springs, West Fork Mudd, Woody, Wyman, and York creeks. Streams with extant or restored cutthroat trout populations will be managed for the conservation of this native species. Such efforts will include conservative cutthroat trout daily bag limits and standard or liberal limits on non-native trout. The short-term goal is to protect nonhybridized populations of westslope cutthroat trout and conservation projects are prioritized based on this criterion. Conservation of extant cutthroat trout populations in the upper Missouri River basin generally involves the construction of a fish barrier to isolate the conservation population from non-native fish. A fish barrier is necessary for cutthroat trout conservation because non-native fish hybridize and compete with native trout, which can lead to native fish extirpation. To date, barriers have been constructed and populations restored in the following streams in the drainage: Cherry, McVey, WF Mudd, York Gulch, SF of NF Divide, Pintler, Bender and Long Branch creeks. Additional barrier and conservation projects expected to be completed or initiated within the timeframe of this management plan include Andrus, Blind Canyon, Bryant, Christiansen, Doolittle, French, Moose, Rock, Schultz, SF Divide, Trapper and Twelvemile creeks. A fish passage project is also expected to occur from South Fork Reservoir into the SF, NF Divide Creek.

The long-term goal of cutthroat trout conservation in the Big Hole River drainage is to have 20% of the historically occupied habitat restored to secure conservation populations of westslope cutthroat trout (see Part 1, 1.6.8(1) Westslope Cutthroat Trout and Westslope Cutthroat Trout Conservation Strategy for the Missouri River Headwaters of Southwest Montana). The Big Hole River and its tributaries supported about 2,400 miles of historically occupied cutthroat trout habitat; therefore, the conservation goal of the drainage is to restore 420 miles of secured habitat to westslope cutthroat trout. The completion of proposed conservation projects in tributaries of the Big Hole River in addition to the existing protected populations (i.e., those with natural barriers and no non-native fish) will have accomplished over 56% of this stated goal.

Priority Drought Waters

Drought related angling restrictions and closure criteria are outlined in the Big Hole Watershed Committee Big Hole River Drought Management Plan. River reaches that typically see drought related angling restrictions or closures are summarized below in Table 2.14-3. All drought related fishing restrictions or closures are implemented and lifted through coordination with the Big Hole Watershed Committee.

Table 2.14-3: Designated hoot owl reaches where drought related fishing restrictions and closures due to fishing pressure, high water temperatures, and/or low flows are expected to be implemented. All drought related fishing restrictions and closures on the Big Hole River are coordinated through the Big Hole Watershed Committee.

Waterbody	Reach	Classification	Criteria
Big Hole River, Section I	NF of the Big Hole River to Saginaw Bridge on Skinner Meadows Rd (RM 98.1 to 144.3)	Non-native salmonid sport fishery	• Daily maximum river temperature reaches or exceeds 73°F for 3 consecutive days. • A full fishing closure will be implemented when average daily flow falls below 20 cfs. • Measurements relevant for criteria will occur at USGS gage 06024450 below Big Lake Creek at Wisdom. • Lifting of temperature related restrictions or closures will occur when daily maximum temperatures are less than 70°F for 3 consecutive days or on September 15. • Lifting of flow related restrictions or closures will occur when flows exceed 40 cfs for 7 consecutive days or October 31.
Big Hole River, Section II	Dickie Bridge to NF of the Big Hole River (RM 71.7 to 98.1)	Non-native salmonid sport fishery	• Daily maximum river temperature reaches or exceeds 73°F for 3 consecutive days. • A full fishing closure will be implemented when average daily flow falls below 100 cfs. • Measurements relevant for criteria will occur at DNRC gage Big Hole River near Wise River, number 41D 08000. • Lifting of temperature related restrictions or closures will occur when daily maximum temperatures are less than 70°F for three consecutive days or on September 15. • Lifting of flow related restrictions or closures will occur when flows exceed 140 cfs for 7 consecutive days or on October 31.
Big Hole River Section III	FWP Maiden Rock FAS to Dickie Bridge (RM 42.5 to 71.7)	Non-native salmonid sport fishery	• Daily maximum river temperature reaches or exceeds 73°F for three consecutive days. • A full fishing closure will be implemented when average daily flow falls below 150 cfs. • Measurements relevant for criteria will occur at USGS gage 06025250 Maiden Rock near Divide.

			• Lifting of temperature related restrictions or closures will occur when daily maximum temperatures are less than 70°F for 3 consecutive days or on September 15. • Lifting of flow related restrictions or closures will occur when flows exceed 200 cfs for 7 consecutive days or on October 31.
Big Hole River Section IV	FWP Tony Schoonen FAS to BLM Maiden Rock site (RM 18 to 42.5)	Non-native salmonid sport fishery	• Daily maximum river temperature reaches or exceeds 73°F for 3 consecutive days. • A full fishing closure will be implemented when average daily flow falls below 190 cfs. • Measurements relevant for criteria will occur at USGS gage 06026210 Big Hole River near Glen. • Lifting of temperature related restrictions or closures will occur when daily maximum temperatures are less than 70°F for 3 consecutive days or on September 15. • Lifting of flow related restrictions or closures will occur when flows exceed 240 cfs for 7 consecutive days or on October 31.
Big Hole River Section V	Confluence with the Jefferson River to FWP Tony Schoonen FAS (RM 0 to 18)	Non-native salmonid sport fishery	• Daily maximum river temperature reaches or exceeds 73°F for 3 consecutive days. • A full fishing closure will be implemented when average daily flow falls below 100 cfs. • Measurements relevant for criteria will occur at USGS gage 06026420 Big Hole River below Hamilton Ditch near Twin Bridges. • Lifting of temperature related restrictions or closures will occur when daily maximum temperatures are less than 70°F for 3 consecutive days or on September 15. • Lifting of flow related restrictions or closures will occur when flows exceed 200 cfs for 7 consecutive days or on October 31.

FISHERIES MANAGEMENT DIRECTION FOR BIG HOLE RIVER DRAINAGE

Water	Miles/Acres	Species	Recruitment Source	Management Type	Management Direction
Big Hole River, headwaters to Dickey Bridge	93 miles	Arctic grayling,	Wild	Conservation	Continue native species conservation to maintain a viable, self-sustaining population of Arctic grayling.
		Burbot Brook trout, Rainbow trout, Brown trout, Mountain whitefish	Wild	General	Continue to manage introduced game species (particularly brown trout) to minimize potential impact on viability of Arctic grayling.
Habitat needs and activities: Continue to improve stream flows, improve riparian habitats through direct restoration, livestock management, and fencing through the CCAA program. Improve stream channel form and function, continue to prevent fish entrainment into irrigation ditches.					
Big Hole River, Dickey Bridge to mouth	72 miles	Brown trout, Rainbow trout, Brook trout, Mountain whitefish	Wild	General	Maintain populations of wild brown trout and rainbow trout within objectives based on criteria outlined in adaptive management strategies described above.
		Arctic grayling, Westslope cutthroat trout	Wild	Conservation	There are few grayling or cutthroat trout in the mainstem Big Hole in this reach. Conservative angling regulations should remain in place for both species.
Habitat needs and activities: Implement and refine drought management plans to minimize impacts on fish populations. Continue to look for opportunities to increase river flows and develop spawning habitat in the Big Hole River downstream from Wise River. Develop projects to reconnect tributary streams and provide year-round fish access and cold flows to the Big Hole River.					
Wise River	25 miles mainstem	Brook trout, Rainbow trout, Brown trout, Hybridized cutthroat trout, Mountain whitefish	Wild	General	Maintain present numbers and sizes. Encourage angler harvest of brook trout to reduce numbers to maintain fish growth.

Water	Miles/Acres	Species	Recruitment Source	Management Type	Management Direction
Habitat needs and activities: Develop drought management plan for Wise River. Improve irrigation infrastructure to improve flows in Wise River to confluence with Big Hole River. Pursue opportunities for habitat improvements in river section from Pettengill Creek to confluence with Big Hole which was affected by the Pettengill Dam breach in 1920s. Remediate impacts of Elkhorn Mine on Elkhorn Creek.					
Mountain Lakes	106 lakes	Westslope cutthroat trout, Hybridized cutthroat trout, Yellowstone cutthroat trout, Rainbow trout, Brook trout, Arctic grayling Golden trout	Wild/Hatchery	Put-and-Take/ General	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 in self-sustaining lakes. Where appropriate, pursue opportunities to expand golden trout into mountain lakes where such management would not conflict with native fish conservation.
Ferguson Lake	16 acres	Westslope cutthroat trout	Hatchery	Put-Grow-and-Take	Reduce daily trout limit to two fish daily and in possession to produce larger stocked westslope cutthroat trout.
Twin Lakes	85 acres	Lake trout, Westslope cutthroat trout, Brook trout, Burbot	Wild Hatchery Wild Wild	Conservation of lake trout and general management for other trout and burbot.	Manage lake to conserve the native lake trout population. Continue annual stocking of westslope cutthroat trout to supplement fishery in lake. Monitor annually for lake trout recruitment. Identify potential lakes to introduce Twin Lakes lake trout to create additional conservation populations.
Miner Lake	66 acres	Arctic grayling, Brook trout, Hybrid cutthroat trout, Burbot, Westslope cutthroat trout	Wild Wild Wild Wild Hatchery	Conservation native grayling population, General for all other species.	Continue to manage for genetically stable and harvestable grayling population according to grayling management strategy. Manage for harvestable populations of other game fish in the lake.

Water	Miles/Acres	Species	Recruitment Source	Management Type	Management Direction
Mussigbrod Lake	116 acres	Arctic grayling, Brook trout, Burbot	Wild Wild Wild	Conservation for native grayling population, General for other species.	Continue to manage for genetically stable and harvestable grayling population according to grayling management strategy. Manage for harvestable populations of other game fish in the lake. Pursue replication of Miner and Mussigbrod grayling populations into additional lake(s) as a conservation measure.
Pintler Lake	39 acres	Arctic grayling, Westslope cutthroat trout, Brook trout, Burbot	Wild	Conservation for grayling, General for other species.	Continue to manage for genetically stable and harvestable grayling population according to grayling management strategy. Manage for harvestable populations of other game fish in the lake. Westslope cutthroat trout are an additional game fish in the lake since cutthroat trout restoration occurred upstream 8 years prior.
Calvert Mine Pond		Westslope cutthroat trout	Hatchery	Conservation	Calvert Mine Pond is an inactive open-pit tungsten mine that maintains water quality sufficient to support a recreational fishery and does not pose any human health concerns. Illegal introduction of brook trout has occurred, but fish appear to have aged out and have not reproduced. Stock mine lake with cutthroat trout at low density to produce additional fishery.
Habitat needs and activities: Collect genetic sample from grayling in Pintler Lake to determine genetic diversity trends.					
Tributary Streams	2160 miles	Arctic grayling (upper Big Hole tributaries), Brook trout, Rainbow trout,	Wild	General	Manage for instream flow and connectivity with mainstem river for spawning and rearing and input of cold water. Manage riparian habitat to improve streambank stability and

Water	Miles/Acres	Species	Recruitment Source	Management Type	Management Direction
		Brown trout, Other native species including Rocky Mountain sculpin, longnose dace, mountain whitefish, longnose sucker, and white sucker.			shading. Reduce and mitigate land management activities on stream channels and riparian areas.
Westslope cutthroat trout conservation tributaries: American, Bear, Bender, Big Lake, Blind Canyon, Bryant, Cherry, Doolittle, Dry, Gory, Governor, Halfway, Jacobson, Jerry, Johnson, Lacy, Lambrecht, Little American, Long Branch, McVey, Meadow, Mono, Moose, Mule, Mussigbrod, NF Divide, Odell, Pintler, Pioneer trib., Plimpton, Rock (west Big Hole), Ruby, Schultz,	398 miles	Westslope cutthroat trout, Arctic grayling and other native fish species	Wild	Conservation	Secure at-risk populations of westslope cutthroat trout in tributary streams through isolation from non-native fish. This may include barrier construction and fish removal. Long-term goal is to secure westslope cutthroat trout conservation populations in 20% of their historically occupied habitats (398 miles). Utilize existing populations of unaltered fish to repopulate future projects. Maintain the Big Hole westslope cutthroat trout brood in Cherry and Granite lakes and work to minimize or eliminate hybridization. Infuse wild genes every generation into the brood from Big Hole sources of nonhybridized cutthroat trout. Use brood for expansion projects into additional tributary streams like French Creek.

Water	Miles/Acres	Species	Recruitment Source	Management Type	Management Direction
Seymour, SF of NF Divide, Sixmile, Spruce, Squaw, Steel, Stine, Swamp, Tenmile, Trapper, Twelvemile, Warm Springs, WF Mudd, Woody, Wyman, and York creeks					
Habitat needs and activities: Work on water conservation projects to improve stream flows and connectivity in streams that are not conservation streams for cutthroat trout. Work with USFS, BLM and DNRC and private landowners on grazing regimes to minimize livestock impacts to streams. Construct or utilize natural fish barriers to preclude non-native fish movement upstream for cutthroat trout conservation. Remove non-native fish and restore westslope cutthroat trout in select streams.					