



-  Tribal Lands
-  Drainage Boundary



Area of Interest



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# **Bighorn River Drainage**

## **Physical Description**

The water source for the Bighorn River begins in Wyoming in the Wind, Shoshone, and Bighorn Mountain ranges before entering Montana, where it also receives water draining from the Bighorn Mountains and Pryor Mountains. The Montana portion of the drainage includes part of the Shoshone River drainage, which drains the south face of the Pryor Mountains (primarily the Sage Creek watershed) and flows into Wyoming, eventually entering Bighorn Reservoir in Wyoming. Land ownership in this drainage includes private, Custer Gallatin National Forest, the Crow Tribe Reservation, Bureau of Land Management (BLM), and State of Montana land.

Yellowtail Dam impounds the Bighorn River to form Bighorn Reservoir, the largest body of water in the watershed. This reservoir supports a popular recreational fishery that includes a diverse assemblage of native and nonnative species. Tributaries to the Bighorn River in Montana above the dam include Dry Head, Hoodoo, Pitchfork, Spring, Black Canyon, Big Bull Elk, Little Bull Elk, Porcupine, and Crooked creeks.

Just 2.2 miles below Yellowtail Dam is the Yellowtail Afterbay Dam which regulates flows to the Bighorn River from power peaking operations at Yellowtail Power Plant. The lower Bighorn River begins at Yellowtail Afterbay Dam and enters the Yellowstone River 86 miles downstream. Tributary streams of the lower Bighorn River include the Little Bighorn River, Rotten Grass Creek, Soap Creek, and War Man Creek. Currently, the Bighorn Canal captures the entire flow of War Man Creek about one mile from its confluence with the river. Lime Kiln Creek is a small stream that enters the Bighorn River just below Yellowtail Dam. Grapevine Creek is an 8-mile long tributary of the Bighorn River that joins the river downstream of Yellowtail Dam.

## **Fisheries Management**

The Crow Reservation covers a large portion of this drainage. In the Reservation boundary, the State of Montana has the authority to manage Bighorn Reservoir, Afterbay Reservoir, and the Bighorn River proper. The Crow Tribe is responsible for management of all other waters in the reservation boundary. Management of tribal waters is not described in this document; however, the Crow tribe, several federal agencies, and FWP signed a [Memorandum of Understanding](#) agreeing to work together to restore Yellowstone cutthroat trout populations in the Bighorn and Pryor mountain ranges.

Completion of Yellowtail Dam altered the fisheries assemblage of the Bighorn River. Historically, this river supported a warmwater assemblage of riverine species. The hypolimnetic release of cold, clear, nutrient rich water now supports a world class tailwater fishery for rainbow trout and brown trout. The Bighorn River rainbow and brown trout fishery is found from Fort Smith to Hardin. The Bighorn River fishery downstream of Hardin transitions into smallmouth bass, walleye, sauger, burbot, and channel catfish. Bighorn Reservoir, created by Yellowtail Dam, provides substantial fishing opportunity for smallmouth bass, walleye, sauger, perch, crappie, brown trout, rainbow trout, and burbot. Afterbay Reservoir is small (181 acres) but provides fishing opportunities for stocked rainbow trout and other species that spillover from Bighorn Reservoir. Mountain streams in the Bighorn and Pryor mountains provide a fishery for Yellowstone cutthroat trout, rainbow trout, brown trout, and brook trout. FWP also

manages smaller streams in this reach that are essentially warm water prairie streams. These smaller streams provide habitat for many native minnow communities.

Walleye and sauger management are being experimentally applied in Bighorn Reservoir because of a genetically unique population of sauger in the reservoir. This unique population is reliant upon wild spawning in the Wyoming portion of the Bighorn River. To reduce potential hybridization rates between these sauger and walleye, and to demonstrate continued commitment to sauger preservation and restoration, FWP initiated stocking sterile walleye (with greater than 90% triploidy) into the reservoir in 2009. Successful stocking efforts have varied and FWP is currently evaluating the growth, survival, and stocking strategies of triploids to improve the program. From 2011–2015, an experimental sauger stocking program was in place to increase sauger abundance and improve angler catch rates and satisfaction. Efforts to stock sauger in the lower portion of Bighorn Reservoir included spawning sauger in Wyoming and subsequently rearing sauger at the Miles City State Fish Hatchery. This program did not meet the stocking request of 250,000 fingerlings annually, instead stocking a total of 329,304 between 2011 and 2014. As such, program staff terminated the stocking program in 2015.

Piney Creek contains the last aboriginal Yellowstone cutthroat trout population in areas managed by FWP in the Pryor Mountains. In 2010, small scale habitat restoration efforts improved the fishery within Piney Creek. A few populations of cutthroat trout can also be found in the Pryor and Bighorn Mountains on the Crow Reservation. An [MOU](#) is in place with the Crow Tribe, BLM, U.S. Forest Service (USFS), U.S. Fish and Wildlife Service (USFWS), and FWP to recover cutthroat trout and to assist each other for potential restoration projects. From 2010 to 2013, a cooperative interagency project in Sage Creek removed brook trout and rainbow trout and replaced the fishery with Yellowstone cutthroat trout. This project has been tentatively considered a success as eDNA sampling in 2017 did not detect presence of brook trout or rainbow trout. A follow up multiagency sampling efforts in 2020 and 2022 detected no rainbow or brook trout. This fishery is now managed as a recreational native cutthroat trout fishery with harvest allowed. In 2008, a brook trout removal and fish barrier project were completed in Crooked Creek. The native Yellowstone cutthroat trout fishery continues a very natural slow downstream expansion.

The Bighorn River drainage falls under the Central District fishing regulations. FWP and the Wyoming Game and Fish Department cooperatively develop the regulations for Bighorn Reservoir. This cooperation keeps the regulations similar in both states for the same water body. Regulations differ from the Central District standards for bass, shovelnose sturgeon, sauger, walleye, catfish, and burbot in Bighorn Reservoir. The Bighorn River regulations have specific sauger regulations that differ from the standard regulation. Other regulation exceptions include Crooked and Piney creeks, which allow catch and release for cutthroat trout only. In Sage Creek, harvest of five Yellowstone cutthroat trout is allowed.

[Angling pressure](#) from 2009 through 2019 was estimated between 136,358 to 202,122 angler days for all three sections of the Bighorn River. In general, the upper 13 miles accounts for 75% of the fishing pressure, of which an average 78% is by out-of-state anglers. In the 2019, the results from a mail-in Angler Survey ranked the upper 13-mile section of the Bighorn River as the #4 most used waterbody in Montana and ranked #1 in FWP Region 5.

## Habitat

The Bighorn River has been the center of water management disputes between Wyoming and Montana stakeholders for nearly three decades. A coordinated effort developed water release criteria for Yellowtail Dam to better support the trout fishery downstream in the Bighorn River. In addition, the National Park Service and State of Wyoming advocated for reservoir elevations that maintain recreation (e.g., motorized boats) and fisheries in the reservoir. Using computer models, Bureau of Reclamation (BOR) developed new operating criteria and improved the transparency of water management by the BOR. These models also provided a better understanding of the hydrologic limitations imposed by varying water supply, reservoir storage, and dam discharge. Operational rules set reservoir drawdown and refill targets based on the shape and volume of inflows, and scheduled dam discharges to balance the conflicting needs for fish and recreation in the reservoir and river downstream. BOR designed rule curves to reduce reservoir drawdown, improve refill, and optimize river flows (i.e., reduce duration of low flows, and duration and magnitude of high flows) to benefit fisheries in the Bighorn River downstream of the dam. While the models are a valuable tool, forecasting error and natural variability in annual water supply from snow melt and unpredictable precipitation events make it impossible to predict all extreme high or low water conditions in the river and reservoir.

After several years of highwater events (i.e., 2017–2019) members of the public, the Bighorn River Alliance, and FWP have requested a review of the rule curves to ensure they address management of above average inflow years as well as below average inflow years. Currently, the BOR is using a working group to review and make recommendations for future management.

Side channel habitat in the Bighorn River has been declining since the dam was constructed in 1967 due to a lack of high spring flows and sedimentation. Many side channels along the Bighorn River have disconnected from the mainstem because the river lacks the necessary stream flow magnitudes to evacuate accumulated sediment on the upstream entrances of the side channels. In addition, subsequent invasive vegetation growth, such as salt cedar and Russian olive trees effectively trap sediment in place, further stabilizing both the bed and banks of these affected side channels. Some side channel heads have been identified for excavation and the first side channel, known as the Cline's channel was successfully reactivated in 2012. A follow up study was conducted in 2019 that assessed changes to the channel migration zone and river morphology. Recommendations for an additional 12 side channel restoration projects were an outcome of this study.

Past efforts have completed several habitat improvement projects within the tributary systems of the Bighorn River drainage, including the installation of a fish barrier in Crooked Creek in 2008 to prevent brown trout from occupying Yellowstone cutthroat trout habitat and range. Improvements to a small private irrigation reservoir on Piney Creek restored volume and converted water withdrawal from an open pipe to a kettle system. This conversion reduced fish lost to irrigation and improved pool habitat. Additionally, the BLM placed logs in Piney Creek to improve substrate and cover habitat. Additional habitat efforts with the BLM are scheduled for Piney Creek in 2023 to improve habitat complexity and reduce wildfire fuels. Other habitat improvement efforts have included regular survey of culverts and other bank projects in Sage Creek to ensure size and placement of culverts/bank projects properly maintain fish passage in the upper watershed, and the Custer Gallatin Forest implemented an extensive culvert and road maintenance to reduce erosion and sediment transport into Crooked Creek.

## **Special Management Issues**

### ***Triploid Walleye Stocking Evaluation***

Bighorn Reservoir provides an excellent opportunity for a walleye fishery; however, natural recruitment is limited because reservoir levels can fluctuate up to 30 feet annually and there is poor spawning and rearing habitat. As such, stocking is needed to maintain a quality fishery. Additionally, protecting the native sauger population that exists in the basin from further introgression with walleye is important. Since 2009, a targeted program stocked sterile triploid walleye fingerlings in the reservoir in various numbers. Little is known about the success of the triploid fingerlings and their contribution to the fishery. Recent (e.g., 2019–2021) ageing of walleye ( $n=278$ ) has shown individual variable and overall rapid growth rates in Bighorn Reservoir, but no distinction was made if these fish were triploid, diploid or a mixed stock. Current work is focusing on the status of the stock, survival, and growth of wild and stocked walleye, and assessing factors that may influence natural recruitment and stocking success (e.g., location of fingerling release, timing, relative abundance of predators).

### ***Yellowstone Cutthroat Trout Conservation***

Several streams in the Pryor's, such as Piney, Dry Head, Crooked, and Sage creeks contain Yellowstone cutthroat trout. Continued monitoring and projects are needed to maintain and increase their populations. For instance, future work is needed to assess the status of Yellowstone cutthroat trout in Dry Head Creek following the Crooked Creek fire in 2021. Follow up efforts may include translocation of Yellowstone cutthroat trout to or from other streams. Habitat improvement efforts with the BLM are scheduled for Piney Creek in 2023 to increase habitat complexity and reduce wildfire fuels. In Crooked Creek, there are tentative plans to reduce or eliminate non-native trout species below the barrier to the reservoir and replace removed individuals with Yellowstone cutthroat trout.

### ***Wetted Perimeter Analysis***

Side channel habitat provides important spawning and rearing habitat for trout and other fishes on the Bighorn River and is critical to maintaining a trophy trout fishery. Rivers will naturally downcut below a dam as sediment transport from upstream is blocked, and thus side channels can become disconnected from the main river channel. Therefore, sustained, high magnitude spring flow events are likely required to maintain the same quality of fisheries habitat in the side channels. These events can transport sediment more effectively, thus decreasing the likelihood of sediment depositing in the side channels and potentially deactivating those side channels. FWP and BOR have managed flow levels on the Bighorn River with an informal agreement established in 1986. The objective of the agreement is to provide adequate flows for riverine trout populations while allowing the BOR the flexibility to deal with changing water availability and other management considerations. In 1997, FWP conducted a wetted perimeter analysis to assess if the flow levels requested under the 1986 informal agreement were adequately maintaining instream habitat. The agreement set target fisheries flows be maintained between 2,000 to 2,500 cfs, with an absolute minimum of 1,500 cfs. Since then, multiple sustained high flow events occurred in the 2010s likely intensifying channel changes. FWP proposes to work with partner agencies and groups and perform an effective instream flow inundation analysis. This analysis is

an updated version of a wetted perimeter analysis and would allow FWP to validate if the recommended flow levels requested under the informal agreement are still valid and provide additional data for the BOR to use when setting flows.

### ***Roving Creel Survey for the Bighorn River***

The biannual mail angler surveys suggest angling pressure is substantially higher now than in 1990 when the last roving creel was conducted. An updated roving creel survey is needed to better assess angler use and their response as the river recovers from the loss of two-year classes of trout. Although per angler harvest is likely low, there is concern the higher number of anglers have increased fishing mortality and harvest since 1990. Results could provide additional insight if harvest, crowding, and other issues, such as hooking mortality or delayed mortality, need to be addressed differently than current operations. Additionally, there has been an increase in nonangler floating and this creel may provide an early measure of nonangler, yet aquatic use, of the upper Bighorn River.

### ***Population Dynamics of Brown Trout in the Bighorn River***

FWP population estimates for brown trout from 2018–2020 are the lowest since standard monitoring protocols began in 1992. Although the population is likely increasing, information regarding population limiting factors for brown trout, such as growth, recruitment, and mortality in the Bighorn River is incomplete. Moving forward, FWP would like to gain additional insight on the governing functions to better define specific management goals and ensure that effective long-term conservation activities (e.g., habitat enhancement) are implemented. The objectives of this evaluation are to estimate the current population dynamics and demographics of brown trout, assess how water management characteristics, including flow and temperature, influence the growth and recruitment of brown trout, and use age structured population models to evaluate potential management scenarios.

### ***Bighorn River Side Channel Restoration***

In coordination with the Bighorn River Alliance, FWP proposes the reconnection of a series of mapped side channels from 2023–2025. The Bighorn River Alliance will take the lead on mechanical excavation of these side channels. FWP plans to support the project, providing technical guidance and personnel as needed. The Bighorn River Alliance and FWP plan to monitor the success and maintenance requirements of this restoration effort.

### ***Carp Removal in Arapooish Pond***

Flooding in 2011, and possibly 2022, has introduced carp into Arapooish pond. Both angler observations and data from electrofishing surveys suggest the bass fishery is in decline. Future work by FWP will include carp removal at Arapooish pond and implementing different bass and game fish stocking strategies to improve fishing opportunities. Additional details for these projects can be found in the tables below.

### FISHERIES MANAGEMENT DIRECTION FOR THE BIGHORN PRYOR RIVER DRAINAGE

Water	Miles/acres	Species	Recruitment Source	Management Type	Management Direction
Bighorn Reservoir (Yellowtail Reservoir)	17,300 acres	Sauger (N)	Wild, Hatchery	Put-Grow-and-Take/ Conservation/General	Monitor population; coordinate with Wyoming Game and Fish for regulation. Support Wyoming Game and Fish habitat actions in the river to maintain and improve this fishery.
		Walleye	Wild, Hatchery	Put-Grow-and-Take/ Quality	Stock only 90%+ triploid fingerlings to reduce risk of hybridization with unique and unaltered sauger in the upper Bighorn River. Provide opportunity to catch walleye with trophy opportunity.
		Smallmouth bass, Yellow perch, Crappie, Brown trout, Channel catfish (N), Burbot (N), Carp	Wild	General	Monitor populations; rely solely on natural reproduction.
		Rainbow trout	Hatchery	Put-Grow-and-Take	Monitor populations, as necessary.
		Native suckers & minnows (N)	Wild	General	Monitor populations, as necessary.
Habitat needs and activities: Make recommendations to BOR for reservoir elevation management, evaluate triploid walleye stocking program.					
Sage Creek	62 miles	Yellowstone cutthroat trout (N)	Wild	Conservation	Maintain fishable population under standard Central District fishing regulations. Monitor for presence of brook trout and remove, if needed.
		Longnose dace, Lake chub,	Wild	Conservation	Monitor populations; rely solely on natural reproduction.

Water	Miles/acres	Species	Recruitment Source	Management Type	Management Direction
		Fathead minnow  Prairie fish assemblage (N)	Wild	General	Maintain populations. If necessary, evaluate feasibility of this becoming a source of certified live bait for Bighorn Reservoir anglers.
Habitat needs and activities: Currently monitoring to ensure Yellowstone cutthroat trout fully re-establish and for presence of non-native trout following chemical treatment in the 2010s. Water goes subsurface frequently once the creek reaches Bowler Flats, several in-channel dams provide refuge for minnow and sucker species, consider efforts to improve habitat. Sage Creek may need some habitat improvement for spawning areas as well as riparian fencing to reduce grazing effects on public and private lands. Consider efforts to improve habitat for minnows and suckers.					
Bighorn Reservoir tributaries (Piney Creek, Dry Head Creek, Crooked Creek)	33 miles	Yellowstone cutthroat trout (N)  Brown trout (Crooked Creek below barrier)	Wild  Wild	Conservation  General/ Suppression	Aboriginal populations, no harvest allowed.  Consider reducing or eliminating this and other non-native trout species in the reach from the barrier to the reservoir and replacing with Yellowstone cutthroat trout. Most of the reach is in Wyoming and would require a coordinated effort.
Habitat needs and activities: Riparian protection needed as many areas in the Pryor Mountains are overgrazed; many road projects could jeopardize trout populations with perched culverts and increased erosion from road work. Barrier placed in Crooked Creek 2008 may need occasional repair, habitat improvements in Piney Creek need to be maintained with joint efforts from the USFS and BLM. Surveys are needed in Dry Head Creek to assess population status following the Crooked Creek fire in 2021.					
Yellowtail Afterbay Reservoir	176 acres	Rainbow trout  Smallmouth bass, Yellow perch, Crappie, Brown trout,	Hatchery/ Wild  Wild	Put-Grow-and-Take  General	Stock in years when full drawdown is not conducted. Drawdown is done every 3 years by BOR to evaluate seeps from dam. Evaluate stocking with considerations for influence on river populations.  Monitor populations; rely solely on natural reproduction and entrainment from Bighorn Reservoir.



Water	Miles/acres	Species	Recruitment Source	Management Type	Management Direction
		Channel catfish (N), Burbot (N), Carp			
Habitat needs and activities: This is a re-regulation reservoir with the potential for 15 vertical feet of elevation change daily, which is a limiting factor to do any substantial fishery management.					
Bighorn River - Downstream of Yellowtail Afterbay Reservoir	84 miles	Sauger (N)	Wild	Conservation	Maintain reduced harvest limits, better understand genetic composition. Investigate opportunities for sauger population improvement in the lower river.
		Channel Catfish (N)	Wild	General	Manage as a recreational fishery.
		Burbot (N)	Wild	General	Evaluate population to assess status.
		Mountain whitefish (N), Rainbow trout, Brown trout, Walleye, Smallmouth bass	Wild	General	Manage as a recreational fishery with focus on cold water species in the river above the Little Bighorn River and cool and warm water species below the Little Bighorn River.
		Native nongame species (N)	Wild	General	Improve documentation of abundance and distribution during standard and other sampling efforts.
Habitat needs and activities: Side channel restoration to maintain habitat diversity in the Bighorn to support a variety of age classes and species. Flow management activities will be required to ensure the fishery is provided adequate water to maintain the fishery. Work with BOR to meet flow targets and timing which support the trout fishery in all water years. Gas super saturation in upper river is a recurring problem; look for ways to reduce the cause and work with BOR and Western Area Power Administration to reduce severity if possible. Increased bank stabilization work negatively influences riverine habitats, work with Conservation District and private landowners to find sustainable ways to protect the fishery and property.					
Arapoish Pond	27 acres	Largemouth bass	Hatchery	General/ Family Fishing water	Occasional re-stocking after winterkills.

Water	Miles/acres	Species	Recruitment Source	Management Type	Management Direction
		Carp, Native suckers (N), Bullheads, Minnows, Smallmouth Buffalo (N)	Wild	General	Fish from the Bighorn River were able to access the pond during flooding in 2011 which introduced carp to the pond. Consider removal of non-native carp from the pond to improve bass fishery and water clarity. Continue population surveys to evaluate if physical or chemical removal of carp is feasible.
<p>Habitat needs and activities: Lake is supported with aeration system to reduce frequency of winterkill, but with more depth the need for air pumps could be eliminated. Partial winterkill has occurred in years with a properly functioning aeration system.</p>					