The fourth milestone addresses data management of recent fisheries surveys and results of genetic analyses. Updating the database entails several mechanisms. FWP biologists enter their data into the data management system soon after they are collected. Likewise, the genetic analyses are entered into the database and department library as soon as they are received from the laboratory. Other agencies or entities require permits to sample fish in Montana, and they must submit their data by the end of the year. Finally, a data management specialist meets with biologists of all agencies on a yearly basis to ensure data addressing fish populations, genetic status, risks to persistence, and barriers are entered into FWP's database.

The fifth milestone occurs on 5-year intervals using data collected annually through regular reporting requirements. The result is a status report that identifies demographic and genetic risks. May et al. (2003) and May et al. (2007) are the first two iterations of this milestone. The next version will provide updates on these factors.

The conservation projects described under the third milestone provide the mechanism to meet the sixth and seventh milestones. Examples of conserving the number and miles of conservation populations include the Lower Deer Creek and Crooked Creek barrier and piscicide projects, the Piney Creek fish screen and habitat enhancement. Each of these projects conserved a core Yellowstone cutthroat trout population at risk of extirpation from sympatry with nonnative species or entrainment into an irrigation canal. Moreover, the conservation partners have restored Yellowstone cutthroat trout to 24 miles in the Sage Creek watershed in the Pryor Mountains. Reclamation of Sage Creek removed the threats posed by nonnative brook trout and rainbow trout. All of the projects worked on annually (Table 5-1) lead towards meeting the sixth and seventh conservation objectives.

6.0 Subbasin Assessments and Conservation Opportunities

This chapter describes the status of Yellowstone cutthroat trout and potential conservation opportunities for individual streams and watersheds. A note on hydrologic nomenclature may be useful in reading this document. The NRCS classification system designates hydrologic units hierarchically, according to a numeric coding system that assigns a hydrologic unit code (HUC) and an associated term[4]. For example, the area draining into the Shields River until its confluence with the Yellowstone River comprises a 4th code HUC, and under this system its narrative descriptor is "subbasin"; therefore, the Shields River 4th code HUC is technically referred to as the Shields River Subbasin. The next smaller hydrologic division is a 5th code HUC, which this system denotes as a watershed. Mill Creek and its tributaries are a designated 5th code HUC, and the technical name for this hydrological unit is the Mill Creek Watershed. In common use, the terms watershed, basin, and drainage are used interchangeably and typically without regard to the size of the drainage under consideration. This document uses the NRCS

[4] http://www.nrcs.usda.gov/programs/rwa/Watershed_HU_HUC_WatershedApproach_defined_6-18-07.pdf

nomenclature when specifically referring to designated HUCs. Otherwise, terms like watershed and drainage will be used generically and may reflect colloquial uses of these terms.

6.1 Yellowstone Headwaters Subbasin (HUC 10070001)

The Yellowstone Headwaters Subbasin originates in Wyoming and Montana, encompassing the area contributing to Yellowstone Lake, and extending to downstream of (Figure 6-1). The majority of this HUC is within Yellowstone National Park and, although national forest and some private lands occur in the northern portion of the watershed. Most of the national forest lands in Montana are also within the Absaroka-Beartooth Wilderness.

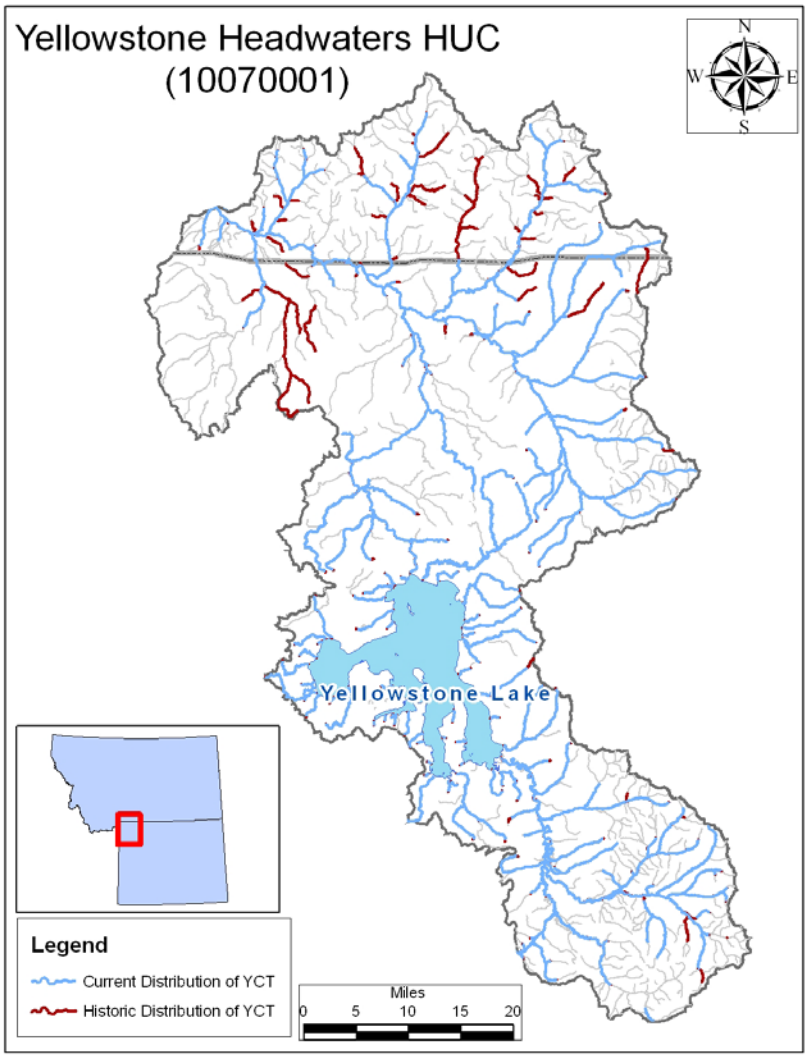

Figure 6-1: Historic and current distribution of Yellowstone cutthroat trout in the Yellowstone Headwaters Subbasin (FWP GIS database).

The Yellowstone Headwaters Subbasin supports the most extensive remaining distribution of Yellowstone cutthroat trout in the Yellowstone River watershed, with 96% of historically occupied stream habitat still supporting the fish (May et al. 2007). Nonetheless, several threats exist. Notably, an illegal introduction of lake trout into Yellowstone Lake was discovered in 1994, and this nonnative species poses a dire threat to Yellowstone cutthroat trout in the system (Kaeding et al. 1995). In addition, whirling disease is limiting recruitment of Yellowstone cutthroat trout to the lake system (Koel et al. 2007). Elsewhere, nonnative brown, brook, and rainbow trout put Yellowstone cutthroat trout at risk from competition, predation, and hybridization.

As a considerable amount of this hydrologic unit lies within national park or designated wilderness, recreation is the primary land use. Park and forest infrastructure such as roads and trails encroach on streams, but agricultural uses are negligible. Wildlife are the primary browsers and grazers in the subbasin, although recreational use of horses is considerable. Historic mining has occurred in the headwaters of some streams, and acid mine drainage and metals loading results in degraded water quality locally.

Genetic testing has occurred on numerous streams within the Montana portions of this watershed (Table 6-1). Genetic status is variable, with nonhybridized, slightly introgressed, and substantially introgressed populations being present. Continued invasion of rainbow trout is a concern for several tributaries in this watershed.

Table 6-1: Summary of genetic analyses conducted in the Montana portion of the Yellowstone Headwaters Subbasin (MFISH database). .

Stream	*Sample No.*	*Sample Size*	*Target Species*	*Percent of Genes*	*Count*	*Collection Date*
Bear Creek	183	10	YCT	83.5	0	10/01/1986
Bear Creek	183	10	RBT	16.5	0	10/01/1986
Bear Creek	11	1	YCT	100	0	08/20/1981
Darroch Creek	1322	10	YCT	100	0	08/04/1998
Darroch Creek	502	3	YCT	100	0	08/01/1991
Eagle Creek	185	25	YCT	93	0	10/01/1986
Eagle Creek	185	25	RBT	7	0	10/01/1986
Lake Abundance Creek	3550	33	YCT	99.8	0	08/13/2007
Lake Abundance Creek	3550	33	RBT	0.2	0	08/13/2007
North Fork Bear Creek	184	10	YCT	62.6	0	10/01/1986
North Fork Bear Creek	184	10	RBT	37.4	0	10/01/1986
Pebble Creek	822	25	YCT	100	0	08/24/1993
Reese Creek	401	25	YCT	96.2	0	07/26/1990
Reese Creek	401	25	RBT	3.8	0	07/26/1990
Slough Creek	3553	36	YCT	0	36	08/14/2007
Slough Creek	971	25	YCT	100	0	08/01/1994
Soda Butte Creek	2957	22	YCT	98.7	0	09/009/2004
Soda Butte Creek	2957	22	RBT	0.7	0	09/009/2004
Soda Butte Creek	2957	22	WCT	0.6	0	09/009/2004
Soda Butte Creek	346	25	YCT	88	0	09/06/1989
Soda Butte Creek	346	25	WCT	12	0	09/06/1989

6.1.1 Soda Butte Creek

Soda Butte Creek (Figure 6-2) and its headwater tributaries originate east of Yellowstone National Park in the Gallatin National Forest (GNF) in Montana, and in the Shoshone National Forest in Wyoming. Although most of the land is in public ownership, small parcels of privately owned lands occur along much of Soda Butte Creek, and include the towns of Silver Gate and Cooke City. The creek flows west into Yellowstone National Park, where it eventually joins the Lamar River. Recreation is the dominant land use in the area, although historic mining has had substantial influence on stream habitat and water quality in portions of this watershed.

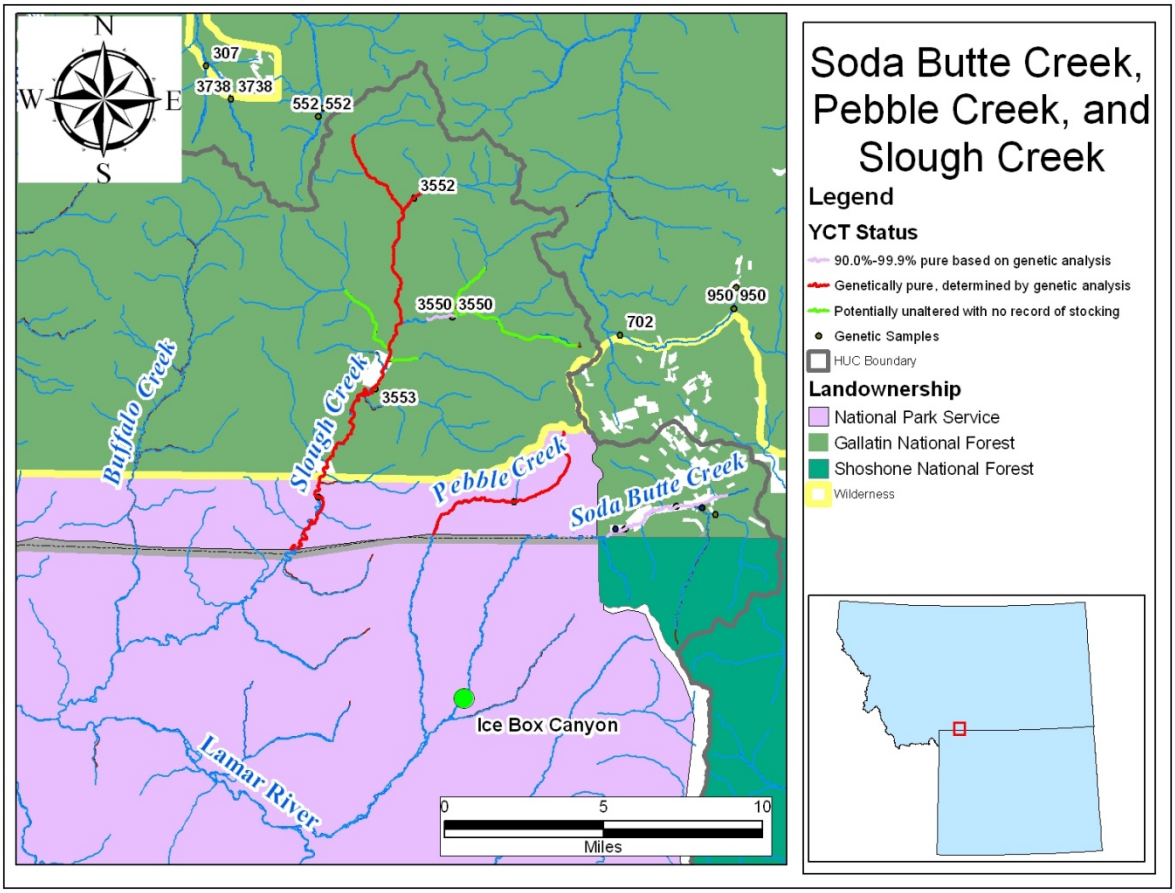

Figure 6-2: Distribution of Yellowstone cutthroat trout in Soda Butte Creek, Pebble Creek, and Slough Creek (FWP GIS database).

Soda Butte Creek supports a slightly introgressed population of Yellowstone cutthroat (Table 6-1). Genetic sampling in 2004 indicated Soda Butte Creek is a conservation population with 98.7% of alleles being of Yellowstone cutthroat trout origin, and 0.7% and 0.6% coming from rainbow trout and westslope cutthroat trout respectively (Wright 2005).

Sympatry with brook trout presents a threat to Soda Butte Creek's cutthroat population. These fish were originally present in a tributary stream, but metals contamination from historic mining formed a chemical barrier that prevented further invasion. Reclamation of mine wastes allowed brook trout to invade Soda Butte Creek and its tributaries. In 2005, FWP removed brook trout from an unnamed tributary using piscicide; however, brook trout managed to invade other waters. An ongoing mechanical removal effort has suppressed brook trout numbers; however, this multi-year, interagency collaboration has not succeeded at removing all the brook trout.

Rainbow trout invasion is another concern for Soda Butte Creek's Yellowstone cutthroat trout. Steep gradient and cascades through Ice Box Canyon have slowed invasion of rainbow trout from the Lamar River, although the occasional rainbow trout is captured during brook trout

removal efforts. Installation of a barrier within this canyon is a planned future action to protect this conservation population.

Downstream of Ice Box Canyon, Soda Butte Creek is open to the influence of rainbow trout in the Lamar River. The fishery likely supports nonhybridized Yellowstone cutthroat trout, extensively hybridized Yellowstone cutthroat trout, and rainbow trout.

The limited success of the brook trout removal, combined with the degree of hybridization (> 1%), has resulted in reconsideration of the conservation approach for Soda Butte Creek. Future planning will evaluate the costs and benefits of two options. The first option would entail continued mechanical removal of brook trout, rainbow trout, and obvious hybrids. The alternative would be chemical removal of the existing fishery, followed by reintroduction of nonhybridized Yellowstone cutthroat trout.

Historic mining has had a pronounced negative effect on water quality and fisheries in Soda Butte Creek. The McLaren mine tailings, located upstream of Cooke City, are a major source of metals and acid mine drainage. Montana Department of Environmental Quality has embarked on reclamation of these tailings with the goal of removing this source of pollutants to Soda Butte Creek.[5] The multi-year project will extend from 2010 through 2015.

Degradation of spawning habitat in an unmapped spring creek following the fires of 1988 likely contributed to a significant loss of recruitment of Yellowstone cutthroat trout to Soda Butte Creek. Long time landowners recalled spawning runs numbering more than 200 fish. Residents of Silver Gate cherished this run, comparing it to Alaskan salmon runs, stating the fish were so numerous “that you could probably walk across their backs”. Recently, local residents sought assistance from FWP to restore habitat so that this run would return.

A combination of natural disturbance and human activities has reduced the quality and quantity of habitat in this once heavily used tributary (Endicott 2009). Notably, hillslope erosion following the 1988 fires contributed considerable amounts of fine, organic sediment in excess of the stream’s ability to transport these fines. A series of undersized, improperly placed culverts further limited the stream’s ability to transport fines. McNeil cores collected in areas where Yellowstone cutthroat trout had been observed spawning found these isolated patches of gravel were in a thin layer over black, anaerobic muck (C.L. Endicott, FWP, personal communication). Despite the absence of gravel through the profile of the streambed, and the preponderance of cohesive, organic material, a few Yellowstone cutthroat trout still spawn in this stream and observations of a several fry in October 2012 indicated limited reproduction occurs.

Restoration of this stream occurred in fall of 2012. The goal was to provide high quality spawning habitat by increasing the stream’s ability to transport sediment and providing clean

[5] See DEQ’s website for more information on reclamation of the McLaren tailings (http://www.deq.mt.gov/abandonedmines/mclaren.mcpx).

gravel to a depth of 1 foot. Installation of biologs, which are rolls of enmeshed coconut fibers, narrowed the channel and increased sinuosity. Within this narrowed channel, the organic, fine-grained substrate was excavated into a sequence of pools and riffles to a depth 1foot lower than the ultimate bed elevation. High quality spawning gravel was placed within the new bed profile. The result is a deeper, narrower, and more sinuous channel with a streambed composed of gravel suitable for spawning trout.

In summary, conservation of Soda Butte Creek's Yellowstone cutthroat trout population will address its various threats: nonnative species, heavy metals, acid mine drainage, and habitat degradation. Construction of a barrier in Ice Box Canyon to prevent further invasion of rainbow trout is a proposed future action. Continued monitoring will allow evaluation of the effectiveness of brook trout removals on managing threats to Yellowstone cutthroat trout. Reclamation using piscicide may be an option if mechanical removal does not provide sufficient protection of Yellowstone cutthroat trout over the long-term. Remediation of the McLaren mine tailings will improve water quality, and will increase the amount of habitat available to support Yellowstone cutthroat trout. Finally, restoration of the small, unmapped tributary flowing through Silver Gate will increase recruitment of Yellowstone cutthroat trout to Soda Butte Creek.

6.1.2 Pebble Creek

Pebble Creek, (Figure 6-2) a tributary of Soda Butte Creek, lies entirely within Yellowstone National Park. Its headwaters are in Montana, but it crosses into Wyoming before its confluence with Soda Butte Creek. As the stream is entirely within the national park, fisheries management falls exclusively to the National Park Service.

Genetic analyses occurred upstream of a canyon reach located immediately upstream of the Pebble Creek campground in 1993 and 2005 (Table 6-1). Neither analysis detected hybridization. A series of small waterfalls within the canyon may be preventing invasion of nonnative species. In contrast, the reach of Pebble Creek downstream of the canyon is open to the influence from fish in Soda Butte Creek, and hybridized Yellowstone cutthroat trout are likely present.

The portion of Pebble Creek upstream of the canyon is one of Yellowstone National Park's remaining strongholds for nonhybridized Yellowstone cutthroat trout, and protecting this population is a conservation priority. Downstream of the canyon, the likely presence of hybrids and risk of brook trout invasion makes the strategy in Pebble Creek the same as Soda Butte Creek. Potential actions include suppression or removal of brook trout or hybrids. Connectivity with the Lamar River, which has experienced an invasion of rainbow trout over the past decade, presents a challenge in securing a Yellowstone cutthroat trout population in lower Pebble Creek.

6.1.3 Slough Creek

Slough Creek (Figure 6-2) originates in the Absaroka-Beartooth Wilderness in Montana, and flows to the south into Yellowstone National Park. Over half of its length is in Montana. Slough Creek enters Wyoming, where it eventually joins the Lamar River in Yellowstone National Park.

Slough Creek was historically home to Yellowstone cutthroat trout from its headwaters to its confluence with the Lamar River. Rainbow trout invaded the lower reaches of Slough Creek following stocking in the 1930s; however, hybridization had not spread to the upper reaches until relatively recently. A canyon reach was thought to be a barrier to upstream fish movement, although rainbow trout apparently can pass this feature during low water years. Anglers reported rainbow trout upstream of the canyon in the late 1990s, and genetic testing confirmed the presence of hybrids in 2002.

Buffalo Creek is a tributary that joins Slough Creek downstream of the canyon. This stream is open to lower Slough Creek, resulting in presence of Yellowstone cutthroat trout, rainbow trout, and hybrids. A barrier exists on Buffalo Creek close to the park boundary. No current fish survey or genetic testing data are available for this stream, and filling this gap is a conservation need.

Given the recent invasion of rainbow trout into upper Slough Creek, the highest conservation priority is to halt the invasion through construction of a fish barrier in Slough Creek Canyon. Additional actions under consideration include selective removal of rainbow trout and hybrids using electrofishing, and changing angling regulations to increase harvest of rainbow trout. Other conservation needs include fish surveys on all tributaries of Slough Creek and Buffalo Creek.

6.1.4 Hellroaring Creek

Hellroaring Creek (Figure 6-3) originates in the Absaroka-Beartooth Wilderness in Montana, and flows south into Yellowstone National Park. Its lowest three miles flow through the park in Wyoming and joins the Yellowstone River.

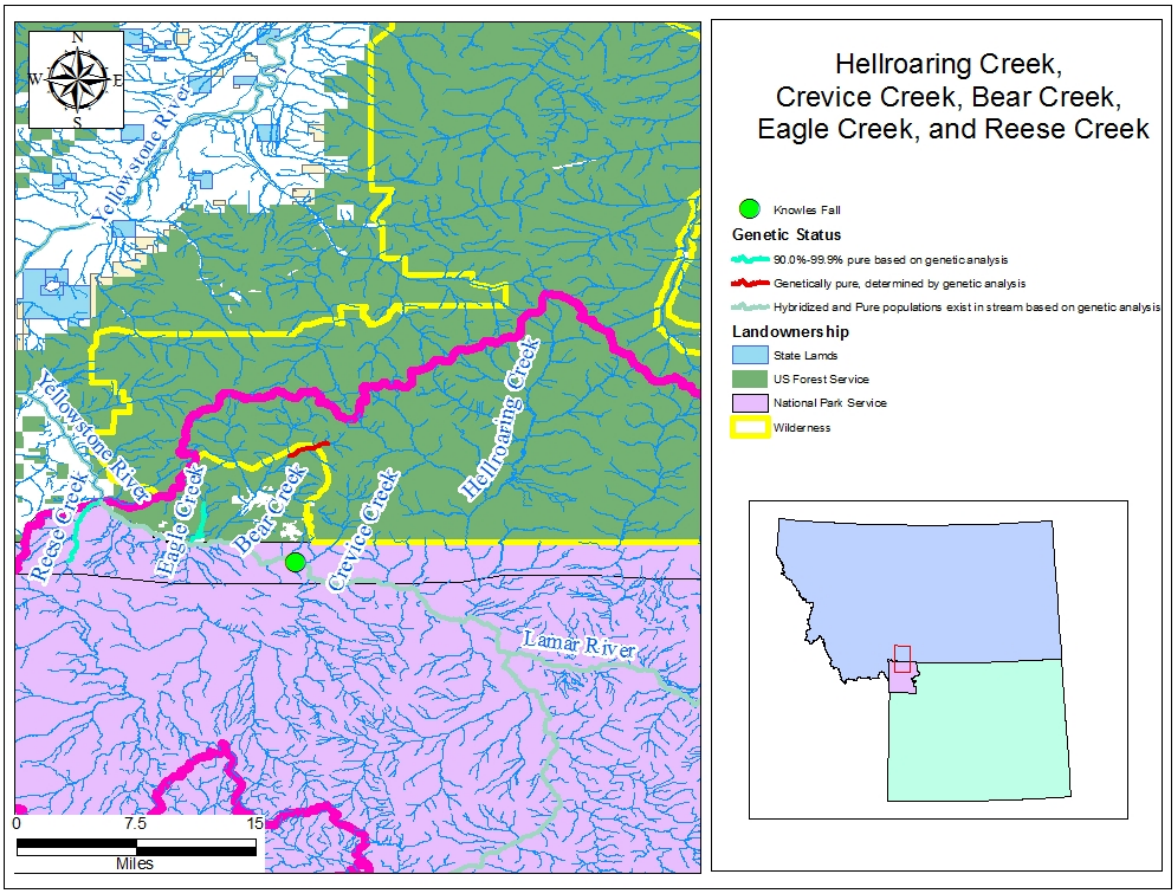

Figure 6-3: Distribution of Yellowstone cutthroat trout in Hellroaring Creek, Crevice Creek, Bear Creek, Eagle Creek, and Reese Creek in the Yellowstone Headwaters Subbasin (FWP GIS database).

Fisheries information is limited for Hellroaring Creek and its tributaries. Yellowstone cutthroat trout occur throughout the watershed and appear to be nonhybridized; however, no genetic analyses are available to verify conservation status. The two lakes in the basin, Carpenter and Charlie White lakes, have self-sustaining populations of Yellowstone cutthroat trout, although their genetic status is unknown. The creek's connectivity to the Yellowstone River and proximity to the Lamar River suggest rainbow trout and other nonnatives have access to Hellroaring Creek, which presents a threat to the basin's Yellowstone cutthroat trout.

The conservation priority for Hellroaring Creek is to conduct baseline investigations on fish community composition, distribution, and genetic status of Yellowstone cutthroat trout. These data will inform development of a specific conservation approach to secure or restore Yellowstone cutthroat trout in the sub-watershed.

6.1.5 Crevice Creek

Crevice Creek (Figure 6-3) is the next major drainage downstream from Hellroaring Creek. This stream and its tributaries lie nearly entirely within Yellowstone National Park or the Absaroka-

Beartooth Wilderness, so human-caused disturbance is unlikely. With a drainage area of over 31,000 acres and 6.6 miles of main stem, this stream has considerable potential to support a population of Yellowstone cutthroat trout if nonnative species have not gained access. The primary conservation need for Crevice Creek is survey to determine species composition, abundance, and genetic status of Yellowstone cutthroat trout if present.

6.1.6 Bear Creek

Bear Creek (Figure 6-3) and its tributaries originate in the Absaroka-Beartooth Wilderness and flow south through the GNF. Bear Creek enters the Yellowstone River at the Yellowstone National Park boundary. Small parcels of privately owned land are also present within the watershed.

Historically, Bear Creek supported Yellowstone cutthroat trout. In the 1980s, heavily hybridized Yellowstone cutthroat trout occupied Bear Creek and nonhybridized Yellowstone cutthroat trout were in North Fork Bear Creek (Table 6-1). Hybridization may be the result of stocking 2,000 catchable rainbow trout into Bear Creek in 1958. Brook trout are also present in the drainage, which presents another threat to the remaining Yellowstone cutthroat trout (S.W. Shuler, GNF, personal communication).

Fluvial Yellowstone cutthroat trout spawn in Bear Creek (Oswald 1984; DeRito 2004) and spawners include nonhybridized Yellowstone cutthroat trout (DeRito 1984). The potential for Bear Creek to recruit Yellowstone cutthroat trout into the Yellowstone River is substantial, and may rival Cedar Creek (see 6.2.6 Cedar Creek), which is the largest known contributor of fluvial fry. In the 1980s, Bear Creek supported the second largest spawning run of streams sampled (Oswald 1984). Investigation of the extent and quality of suitable spawning habitat available is a conservation need.

Darroch Creek, a three-mile-long tributary, may provide an opportunity to expand stream miles occupied by Yellowstone cutthroat trout. Yellowstone cutthroat trout are present downstream, but not upstream, of a natural barrier a short distance from its mouth (C. M. Sestrich, GNF, personal communication). Several investigations would be useful in determining the conservation potential for Darroch Creek. Evaluation of the genetic status of Yellowstone cutthroat trout below the barrier, and determination of the effectiveness of the barrier, are primary conservation needs. Depending on the results, Darroch Creek may be a candidate for expanding Yellowstone cutthroat trout within its native range.

Given the age of the available genetics information, verification of the genetic status of Yellowstone cutthroat trout in Bear Creek and North Fork Bear Creek is a conservation priority. Should nonhybridized or slightly hybridized fish still exist in the drainage, future planning should include development of a strategy to protect these fish. Brook trout removal is among the potential options, given the tendency of this nonnative species to displace Yellowstone cutthroat

trout, especially in small headwater streams. Likewise, barrier construction may be warranted to prevent reinvasion by brook trout or rainbow trout.

If no core or conservation populations of Yellowstone cutthroat trout remain in the Bear Creek watershed, reclamation using piscicide or mechanical removal, followed by reintroduction of nonhybridized Yellowstone cutthroat trout, are potential activities. Again, barrier construction may be a necessary component of this approach in order to prevent reinvasion of nonnatives. Factors to consider in developing a specific approach include the extent of the available habitat for Yellowstone cutthroat trout with construction of a barrier. Bear Creek is about 10 miles long, and has several tributaries with the potential to support fish. Therefore, this stream may provide sufficient habitat to support a population of Yellowstone cutthroat trout over the long-term, even though barrier construction may be a necessary component of Yellowstone cutthroat trout conservation in Bear Creek.

Bear Creek formerly supported a small hydropower facility and a preliminary permit to resume hydropower on Bear Creek expired in 2010. Should interest in power production in Bear Creek resume, agencies will need to work with power producers to minimize the effect of the facility on fish. The potential for this development to occur is unknown.

Gold mining has occurred at several locations within the Bear Creek watershed and physical reclamation has been completed at the Mineral Hill Mine (M. Marks, GNF, personal communication). Drainage from the tailings facility is contained on-site. The operator has a Montana Discharge Elimination System allowing discharge of water to Bear Creek, although no discharge has occurred yet. Macroinvertebrate monitoring has not indicated impairment from metals; however, the invertebrate populations have suggested sediment loading at the sampling station downstream of the mine.

DEQ lists Bear Creek as impaired for low flow alterations and temperature. Opportunities to increase in-stream flows may exist for Bear Creek. Currently, FWP has 2 in-stream flow reservations on Bear Creek. A 22 cfs (cubic feet per second) water right for mining related activities also exists on Bear Creek (S.T. Opitz, FWP, personal communication). FWP will work with the water rights holder to evaluate the potential to convert that water to improve the fishery. Maintaining in-stream flows would be beneficial to the resident and fluvial fisheries.

6.1.7 Eagle Creek

Eagle Creek (Figure 6-3) is a tributary of the Yellowstone River that enters near Gardiner, Montana This 3-mile-long stream originates in the GNF and enters private land near its mouth. In 1986, Eagle Creek supported a conservation population of Yellowstone cutthroat trout, with 7% of alleles being of rainbow trout origin (Table 6-1). Fisheries investigations in the 1990s and 2009 found Yellowstone cutthroat trout hybrids and brook trout (S.W. Shuler, GNF, personal communication).

Three culverts present fish passage barriers in the Eagle Creek watershed (C. M. Sestrich, GNF, personal communication). One culvert is near the mouth and may be a beneficial barrier by keeping nonnatives from accessing Eagle Creek. Two other culverts are on tributary streams and prevent fish movement into these tributaries.

Conservation planning for Eagle Creek should address several issues. First, genetic status of this population may have changed in the 25 years since the last genetic testing, especially if rainbow trout from the Yellowstone River have free access to Eagle Creek. If a conservation population still exists, protecting it would be a priority. Potential actions may include removal of nonnatives and maintaining the lowest culvert as a fish passage barrier. The size of the watershed is a consideration in prioritizing Eagle Creek for such activities. Other culverts on tributaries to Eagle Creek are impassable and could be replaced with arched culverts if Yellowstone cutthroat trout conservation is a priority in the watershed. At only 3 miles in length, Eagle Creek would not have the capacity for long-term support of a Yellowstone cutthroat trout population that a stream affording more habitat could provide.

6.1.8 Reese Creek

Reese Creek (Figure 6-3) originates in Yellowstone National Park and flows to the north for 5 miles, until its confluence with the Yellowstone River, downstream of Gardiner. Reese Creek supports a slightly hybridized population of Yellowstone cutthroat trout, with 3.8% of alleles being of rainbow trout origin (Table 6-1). Nonnative fishes reside in Reese Creek up to a restrictive irrigation diversion and include rainbow trout, brook trout, and hybrids.

Reese Creek supports a spawning run of fluvial Yellowstone cutthroat trout and 44% of captured spawners were nonhybridized (M. Ruhl, YNP, personal communication). Dewatering was once a constraint on the fluvial and resident fish; however, YNP negotiated an agreement for water use that maintains a minimum of 1.6 cfs in Reese Creek. Water rights held by the GNF present a potential for further maintaining in-stream flows in Reese Creek if the USFS is willing to convert this right to in-stream flows. This action would be consistent with YNP's conservation objectives for Reese Creek.

6.1.9 Yellowstone River

The portion of the Yellowstone River (Figure 6-3) within the Montana part of the Yellowstone Headwaters Subbasin begins where the Yellowstone River crosses the border into Montana downstream of the confluence with Hellroaring Creek in Yellowstone National Park, and extends to several miles downstream of Gardner, Montana.

The reach of the Yellowstone River within Yellowstone National Park and Montana is home to a fish assemblage identical to that in the river downstream. Species present include Yellowstone cutthroat trout, mountain whitefish, and nonnative brown and rainbow trout (Table 6-2). Although not listed in the MFISH database)., native suckers and mottled sculpin are also likely present in this portion of the river.

Table 6-2: Distribution and abundance of fishes in the Yellowstone River within the Yellowstone Headwaters HUC (MFISH database).

Begin Mile	*End Mile*	*Species*	*Abundance*	*Genetic Status*	*Data Rating*
554	559	Mottled sculpin	Unknown	Not applicable (N/A)	EBS[16]
519	559	Rainbow trout	Common	Tested conservation	EBS
548	559	Yellowstone cutthroat trout	Common	Nonhybridized	EBS
379	559	Mountain whitefish	Abundant	N/A	EBS
375	559	Brown trout	Common	N/A	EBS
454	559	Brook trout	Rare	N/A	EBS

Knowles Falls (Figure 6-3) restricts the distribution of several fish species within the Montana portion of the Yellowstone River. Mountain whitefish do not extend past these falls. Brown trout occur up to the falls, and have been reported, but not documented in the Yellowstone River upstream of Knowles Falls. Rainbow trout are present in the Lamar River, and have potential to disperse into the Yellowstone River and its adjacent tributaries.

Collection of current information on species presence, distribution, abundance, and genetic status of Yellowstone cutthroat trout is a conservation need for the portion of the Yellowstone River within Yellowstone National Park. As riverine Yellowstone cutthroat trout tend to spawn in tributaries, identifying spawning areas and ensuring access to these would also be beneficial. Brown trout and rainbow trout in the Yellowstone River upstream of Knowles Falls are threats to Yellowstone cutthroat trout throughout a large portion of the Yellowstone River basin within the national park. Determining their distribution and abundance would inform development of specific strategies to protect and secure Yellowstone cutthroat trout populations.

6.2 Upper Yellowstone River Subbasin (HUC 10070002)

The Upper Yellowstone River Subbasin (Figure 6-4) lies entirely within Montana, originating at the confluence of the Yellowstone River downstream of Gardiner, Montana, and extending to the confluence of Bridger Creek. The watershed contributing to Paradise Valley comprises a substantial portion of the hydrologic unit. Major subdrainages downstream of Paradise Valley include the Boulder River, Big Timber Creek, Sweet Grass Creek, and Otter Creek.

[6] EBS = extrapolated, based on surveys