

The presence of rainbow trout and hybrids presents a substantial threat to the Yellowstone cutthroat trout in Shively Creek. Potential actions include reclaiming the stream for Yellowstone cutthroat trout, and installation of barrier to prevent reinvasion of nonnative species. Future conservation planning for Shively Creek should consider the potential to expand the extent of habitat occupied by Yellowstone cutthroat trout into East Pryor Creek.

6.8.5 Hay Creek

Hay Creek (Figure 6-41) originates on the northeast face of the Pryor Mountains and flows entirely within the Crow Reservation for nearly 20 miles before entering Pryor Creek. Much of Hay Creek has prairie stream affinities, and does not provide habitat suitable for Yellowstone cutthroat trout. The trout-bearing portion of Hay Creek is the seven miles upstream of the Pryor - St. Xavier BIA road. This reach supports nonhybridized Yellowstone cutthroat and brook trout.

Brook trout are a substantial threat to persistence of the Yellowstone cutthroat trout in Hay Creek. Options to protect this core population include removal of brook trout and installing a barrier. Brook trout suppression may be an appropriate interim tool in reducing interspecific competition, and would allow Yellowstone cutthroat trout to increase in abundance.

6.8.6 Lost Creek

Lost Creek (Figure 6-41) originates on the northern face of the Pryor Mountains and flows northerly through Lost Creek Canyon on tribal lands for approximately seven miles before flowing sub-surface into a large alluvial outwash at the mouth of the canyon. From this outwash, Lost Creek extends five more miles to Pryor Creek just upstream from the town of Pryor. An irrigation diversion captures the entire flow of Lost Creek at the mouth of the canyon and conveys it westerly approximately 3.5 miles to the Pryor Creek Ditch.

Historically, Lost Creek was barren of fish; however, the canal has provided a conduit for invading brook trout and consequently Lost Creek now supports a robust population of brook trout. A natural waterfall barrier (6 feet high) exists approximately 1.5 miles upstream from the diversion, which confines brook trout below the barrier and protects the upper fishless portion of the stream.

The Lost Creek ditch screening project began in 2010 as a conservation effort to eliminate brook trout and introduce Yellowstone cutthroat trout to this previously unoccupied habitat within the Pryor Creek watershed. This project will establish Yellowstone cutthroat trout throughout the Lost Creek drainage, while eliminating the threat of upstream reinvasion of brook trout.

6.9 Bighorn Lake Subbasin (HUC 10080010)

The Bighorn Lake hydrologic unit (Figure 6-42) straddles the Montana/Wyoming border, with about three quarters of the watershed being in Wyoming. The presumed historic distribution of Yellowstone cutthroat trout in this hydrologic unit encompassed 278 miles of stream, but Yellowstone cutthroat trout are now present in 64 miles stream habitat (May et al. 2007).

Remaining populations are isolated and occupy short reaches of streams. These factors put the remaining populations at high risk of extirpation.

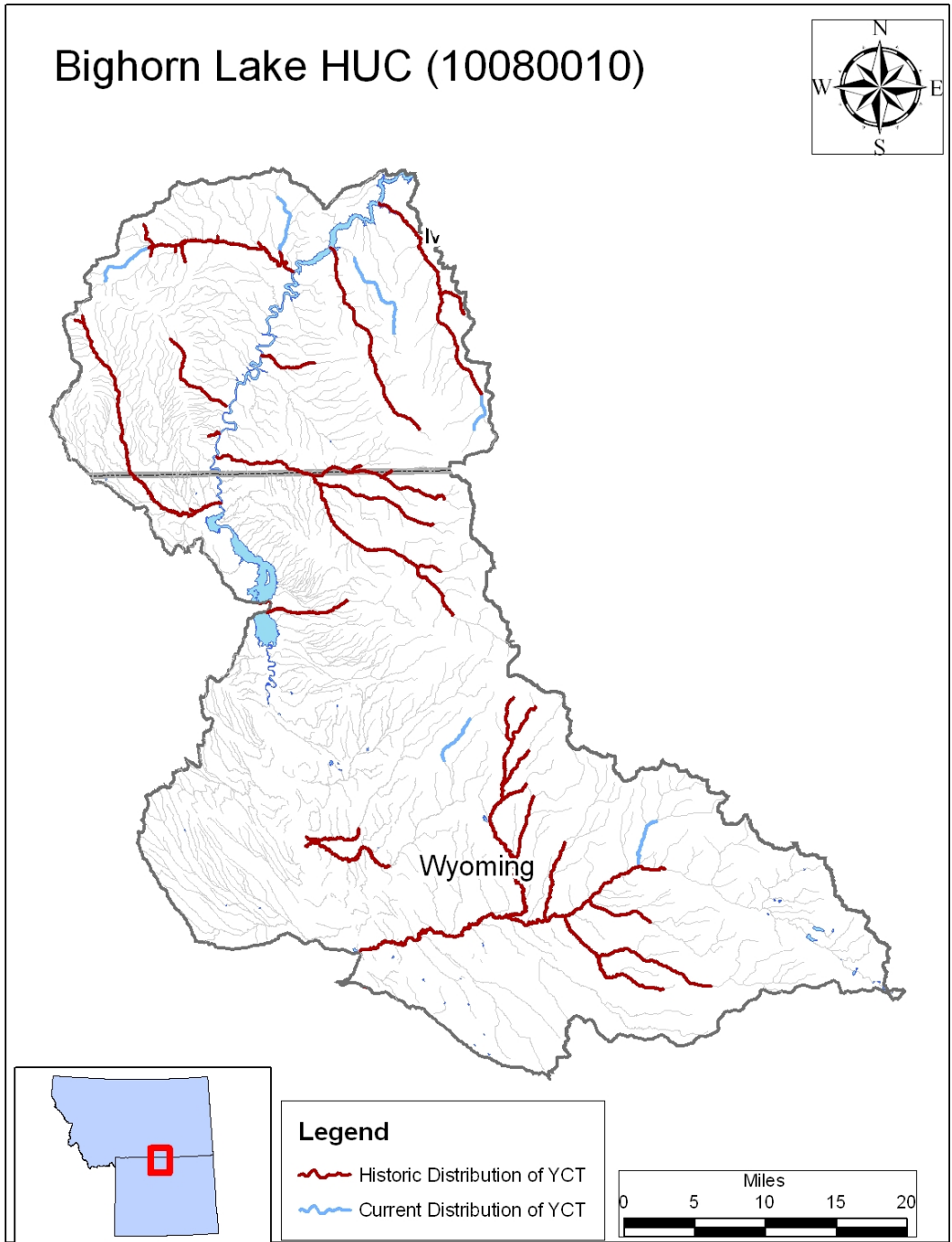


Figure 6-42: Bighorn Lake Subbasin (HUC 10080010).

Yellowtail Dam is at the downstream extent of this hydrologic unit, and this structure impounds the Bighorn River to form Bighorn Lake, which is 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 (Table 6-61). The Bighorn River was unlikely to provide significant habitat to Yellowstone cutthroat trout historically (May et al. 2007), and warm water temperatures likely make the reservoir unsuitable for establishment of a Yellowstone cutthroat trout population. Brown trout in Bighorn Lake have access to the adjacent tributarie and present a threat to remaining populations of Yellowstone cutthroat trout in these streams.

Table 6-61: Fishes rating as common and abundant in Bighorn Lake (MFISH database).

<i>Common Name</i>	<i>Scientific Name</i>	<i>Origin</i>	<i>Abundance</i>	<i>Data Rating</i>
Black crappie	<i>Pomoxis nigromaculatus</i>	Nonnative	Common	EFMSO
Brown trout	<i>Salmo trutta</i>	Nonnative	Common	EFMSO
Burbot	<i>Lota lota</i>	Native	Common	EFMSO
Channel catfish	<i>Ictalurus punctatus</i>	Native	Common	EFMSO
Common carp	<i>Cyprinus carpio</i>	Nonnative	Common	EFMSO
Emerald shiner	<i>Notropis atherinoides</i>	Native	Abundant	EFMSO
Longnose sucker	<i>Catostomus catostomus</i>	Native	Common	EFMSO
River carpsucker	<i>Carpoides carpio</i>	Native	Common	EFMSO
Sauger	<i>Sander canadensis</i>	Native	Common	EFMSO
Shorthead redhorse	<i>Moxostoma macrolepidotum</i>	Native	Common	EFMSO
Shovelnose sturgeon	<i>Scaphirhynchus platyrhynchus</i>	Native	Common	NSPJ
Smallmouth bass	<i>Micropterus dolomieu</i>	Nonnative	Abundant	EFMSO
Walleye	<i>Sander vitreus</i>	Nonnative	Abundant	EFMSO
White sucker	<i>Catostomus commersoni</i>	Native	Common	EFMSO
Yellow perch	<i>Perca flavescens</i>	Nonnative	Common	EFMSO

Within the Montana portions of the Bighorn Lake HUC, several streams supported Yellowstone cutthroat trout historically. Remaining populations are restricted to headwater portions of streams, and are isolated from other populations. This isolation, combined with small extent of occupied habitat, puts these populations at risk of extirpation. To date, genetic testing has found only nonhybridized Yellowstone cutthroat trout in the watershed (Table 6-62). These nonhybridized populations on the fringe of the remaining range have considerable conservation value, and securing these populations is consistent with the highest priority under the cutthroat trout Agreement (MCTSC 2007).

Table 6-62: Summary of genetic analyses for streams sampled in the Bighorn Lake HUC (MFISH database).

<i>Stream</i>	<i>Sample No.</i>	<i>Sample Size</i>	<i>Target Species</i>	<i>Percent of Genes</i>	<i>Collection Date</i>
Big Bull Elk Creek	1323	18	YCT	100	10/27/1998
Big Bull Elk Creek	1222	7	YCT	100	08/07/1996
Big Bull Elk Creek	810	5	YCT	100	08/18/1993
Crooked Creek	3321	20	YCT	100	08/01/2006
Crooked Creek	147	24	YCT	100	09/11/1985
Dry Head Creek	761	4	YCT	100	07/13/1993

6.9.1 Dry Head Creek

Dry Head Creek (Figure 6-43) originates from numerous springs on the east slopes of the Pryor Mountains, and flows through the CNF and then the Crow Reservation until its confluence with the Bighorn River. The creation of Bighorn Lake resulted in the inundation of the lowest portion of the creek, with two miles of former channel being under water when the reservoir is at full pool. The upper two miles of the creek flows subsurface and the stream reemerges as a large spring upwelling about 13 miles upstream from the mouth.

Dry Head Creek supports a population of nonhybridized Yellowstone cutthroat trout, although invasion of brown trout puts this population at risk. Drought extending from 1999 to 2001 apparently wiped out Dry Head Creek's Yellowstone cutthroat trout. The current population is the result of reintroduction into the reaches within the CNF in 2001 through 2003. Livestock grazing practices present another threat to Yellowstone cutthroat trout, and development of grazing strategies that are compatible with fisheries and stream health is a conservation need.

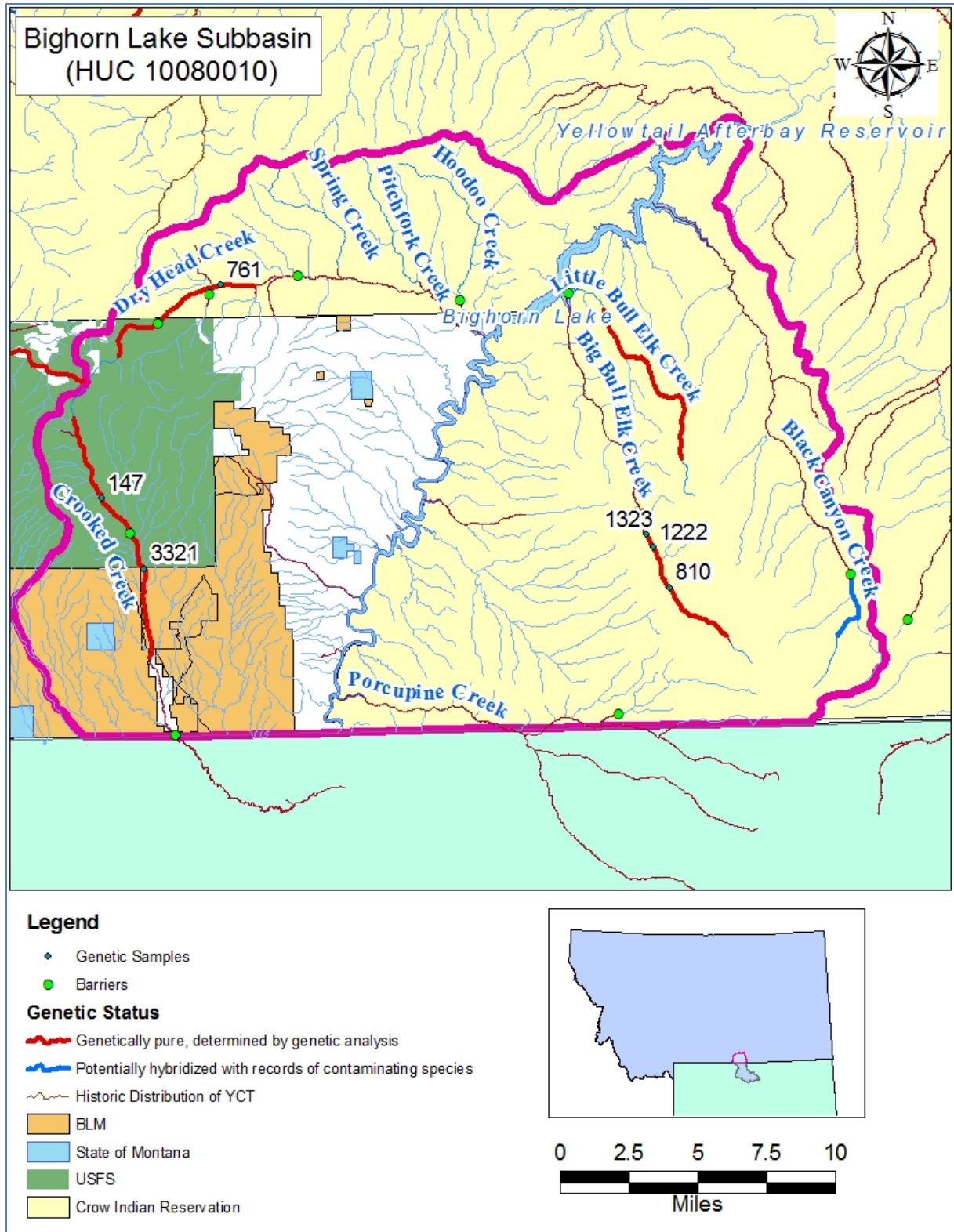


Figure 6-43: Montana portions of the Bighorn Lake HUC.

Additional fish surveys would be beneficial in developing specific strategies to protect Dry Head Creek's Yellowstone cutthroat trout population. Most sampling has occurred within the CNF. Expanding fish surveys into the Crow Reservation would be useful in determining the extent of Yellowstone cutthroat trout distribution in the drainage.

Sympatry with brown trout presents a long-term threat to the remaining Yellowstone cutthroat trout in Dry Head Creek. Potential activities include suppression or removal of brown trout. Field surveys for suitable barrier sites are also needed.

6.9.2 Hoodoo Creek

Hoodoo Creek (Figure 6-43) originates on the east face of the Pryor Mountains, and flows to the south until its confluence with Bighorn Lake. Before the reservoir inundated its lower reaches, Hoodoo Creek was a tributary of Dry Head Creek. Landownership is nearly entirely within the Crow Reservation, with the exception of its lowest reach, which is under private ownership.

Historically, Hoodoo Creek supported Yellowstone cutthroat trout; however, brown trout now occupy its lower reaches. Upstream of a barrier located about 1 mile from its confluence with Bighorn Lake, a natural barrier prevents upstream movement of fish, and this reach is barren of fish.

Current livestock grazing practices limit Hoodoo Creek's suitability for restoration of a Yellowstone cutthroat trout population. Implementing best management practices that allow the channel and riparian area to recover, while maintaining agricultural productivity, would need to be the first step. Should improvements in stream habitat and riparian condition occur, the barrier on Hoodoo Creek may provide secure habitat for establishment of a core population of Yellowstone cutthroat trout.

6.9.3 Pitchfork Creek

Pitchfork Creek (Figure 6-43) is a tributary of Dry Head Creek; it flows through a mixture of tribal and private lands before joining Dry Head Creek. Pitchfork Creek likely supported Yellowstone cutthroat trout historically; however, no information is available on its current fish assemblage. Livestock grazing practices along Pitchfork Creek are incompatible with fisheries needs, and limit the stream's potential to support a healthy fishery. Conservation planning for Pitchfork Creek should focus on the potential to improve stream health through implementation of agricultural BMPs, and conducting surveys to determine status and potential of the stream's fishery.

6.9.4 Spring Creek

Spring Creek is another tributary of Dry Head Creek and flows entirely within the Crow Reservation (Figure 6-43). Yellowstone cutthroat trout were likely present in Spring Creek historically; however, brown trout now occupy its entire length. Livestock grazing practices are currently incompatible with fisheries needs, and restoring health and function to the stream corridor would need to be a first step in reestablishing a Yellowstone cutthroat trout population.

6.9.5 Black Canyon Creek

Black Canyon Creek (Figure 6-43) and its tributaries originate from numerous springs along the western terminus of the Bighorn Mountains in the Crow Reservation. The stream flows to the north through a deeply incised canyon for about 22 miles until its confluence with Bighorn Lake. Bighorn Lake inundates the lowest three miles of Black Canyon Creek when at full pool.

Historically, Yellowstone cutthroat trout occupied the lower 17 miles of Black Canyon Creek. Following construction of a tribal youth camp and access road in 1959, the USFWS introduced rainbow trout, brown trout, and brook trout into Black Canyon Creek. Despite these successful introductions, a small number of Yellowstone cutthroat trout persist today, although the genetic status of these fish is unknown.

Black Canyon Creek has several opportunities for reintroduction or range expansion of Yellowstone cutthroat trout. Although nonnative fish thrive in the main stem, several tributaries contain adequate stream habitat with natural fish barriers or potential barrier construction sites. Data needs include surveys of habitat and potential barrier sites in Black Canyon and its unnamed tributaries.

6.9.6 Big Bull Elk Creek

Big Bull Elk Creek (Figure 6-43) originates from numerous springs on the west side of the Bighorn Mountains on the Crow Reservation, and flows for 16 miles before its confluence with Bighorn Lake. The stream and its tributaries occupy deeply incised canyons for their entire lengths.

Historically, Yellowstone cutthroat trout occupied the entire drainage downstream from a barrier falls in the headwaters, and nonhybridized Yellowstone cutthroat trout continue to occupy the upper five miles of stream. Presumably, a barrier exists downstream of this Yellowstone cutthroat trout stronghold, and brown trout and a few Yellowstone cutthroat trout occupy the rest of Big Bull Elk Creek.

The conservation priority for Big Bull Elk Creek is to preserve the remaining Yellowstone cutthroat trout in the drainage. Opportunities to increase the amount of habitat occupied by Yellowstone cutthroat trout without brown trout may also be present. The lateral confinement provided by the canyon walls likely provides suitable locations for construction of a barrier. Barrier construction combined with removal of nonnative brown trout could provide substantially more secured habitat for Yellowstone cutthroat trout.

6.9.7 Little Bull Elk Creek

Little Bull Elk Creek (Figure 6-43) is a former tributary of Big Bull Elk Creek and bears several similarities to this stream. Springs feed the headwaters of Little Bull Elk, and the stream flows through a deeply incised canyon. Creation of Bighorn Lake has inundated the lower portions of Little Bull Elk Creek and Big Bull Elk Creek, and Little Bull Elk Creek now drains directly to the reservoir.

A series of waterfalls near the mouth of Little Bull Elk Creek prevented expansion of Yellowstone cutthroat trout, or subsequently introduced species into Little Bull Elk Creek. In 1999, the U.S. Fish and Wildlife Service transferred 83 adult Yellowstone cutthroat trout from Big Bull Elk Creek into Little Bull Elk Creek in an effort to expand their range. This effort was apparently successful, as monitoring in 2001 documented two years of reproduction. Future conservation actions may include continued introduction efforts and documentation of downstream population expansion into Little Bull Elk Creek.

6.9.8 Porcupine Creek

Porcupine Creek (Figure 6-43) and its tributaries originate in the Bighorn Mountains of northern Wyoming and flow through Big Horn National Forest, tribal lands, and private lands for about 30 miles. The majority of the Porcupine Creek watershed is in Wyoming, and only a portion of the main stem and a few tributaries are in Montana.

Historically, Yellowstone cutthroat trout likely existed throughout much of the Porcupine Creek drainage. They currently occupy a few headwater streams in Wyoming. Little is known about the Montana portions, which lie entirely within the Crow Reservation. Surveys for the Montana portion are a high priority. Specific conservation actions will follow determination of species composition and related physical factors affecting distribution and potential.

6.9.9 Crooked Creek

Crooked Creek (Figure 6-43) originates in the south end of the Pryor Mountains, and flows south into Wyoming, eventually joining Bighorn Lake. In Montana, most of Crooked Creek flows through the CNF and BLM lands, although the lower four miles flow through private property. Crooked Creek has been the subject of considerable effort to secure the remaining Yellowstone cutthroat trout present in this stream.

Crooked Creek supports a population of nonhybridized Yellowstone cutthroat trout, which was sympatric with brook trout in its upper reaches. A couple of natural barriers exist in Crooked Creek, and the uppermost barrier provides a small refuge of stream habitat for Yellowstone cutthroat trout that was free of nonnative brook trout. Catastrophic flooding and debris flows following a wildfire resulted in extirpation of brook trout from reaches of Crooked Creek within the CNF and BLM lands. Biologists from FWP, BLM, and the CNF mobilized to install a barrier to prevent reinvasion of nonnative trout from downstream reaches. Unfortunately, brown trout gained access over a temporary gabion barrier and spawned, resulting in a newly established population of brown trout within this reach.

Mechanical fish removals ensued over the next few years, while agency biologists raised grant funds for construction of a permanent concrete barrier. Electrofishing proved an ineffective means to achieve total elimination of brown trout. Each removal event yielded similar numbers of brown trout, indicating these efforts were not depleting the brown trout population. Following construction of the concrete barrier in 2007, fisheries managers decided that piscicide was the

only viable option to secure the native Yellowstone cutthroat trout population, and provide them with sufficient habitat to ensure the population's long-term survival.

Piscicide application occurred in 2008, and subsequent monitoring found this effort was successful in removal of nonnative brown trout. Remaining conservation actions for Crooked Creek will include monitoring to document downstream movement of Yellowstone cutthroat trout into the reclaimed stream, and evaluation of the efficacy of the barrier in preventing reinvasion of nonnative fishes. In addition, genetic monitoring is a potential activity that will determine if low population size and inbreeding depression present threats to Crooked Creek's native Yellowstone cutthroat trout population.

6.10 Shoshone River Subbasin (HUC 10080014)

The Shoshone River HUC (Figure 6-44) lies mostly in Wyoming, with a small portion extending north into Montana. Historically, Yellowstone cutthroat trout occurred throughout the Shoshone River main stem and many of its tributaries. Until recently, Yellowstone cutthroat trout were restricted to a short expanse of Piney Creek, a small spring creek on the west side of the Pryor Mountains in Montana. In 2010, a conservation effort to restore Yellowstone cutthroat trout into the creek resulted in release of Yellowstone cutthroat trout into the creek following an initial piscicide project aimed at removing nonnative brook trout and rainbow trout.

The Sage Creek watershed encompasses the majority of the Montana portion of the Shoshone HUC (Figure 6-44). Streams in the Sage Creek watershed originate in the Pryor Mountains, and landownership includes CNF, the Crow Reservation, and BLM lands. The valley portions of the Sage Creek watershed flow through arid scrubland. Currently, the suitable potential habitats for Yellowstone cutthroat trout are restricted to headwaters portion of the basin within the Pryor Mountains.