Brackett Creek, Lazy S Ranch

Initial Project Assessment and Preliminary Evaluation of Completed Restoration

May 24, 2007

Prepared by:
Carol Endicott
MFWP
Yellowstone Cutthroat Trout Restoration Biologist
Landowner Incentive Program
111 ½ North 3rd Street
Livingston, MT 59047

Montana Fish, Wildlife & Parks

Table of Contents

List of Figures

1.0 Introduction

Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri*), a species native to Montana, has experienced declines in abundance and distribution throughout its historic range. Seeking to reverse this trend on private lands, the Landowner Incentive Program/Yellowstone Cutthroat Trout project (LIP/YCT) assists private landowners seeking to improve habitat for Yellowstone cutthroat trout on their property. This report, or project assessment, documents preliminary evaluations for potential and completed projects on Brackett Creek. The objectives of the project assessment are to summarize relevant literature and data, describe existing conditions and potential, and provide recommendations to landowners. If landowners agree to proceed with conservation activities, Montana Fish, Wildlife & Parks' Yellowstone cutthroat trout restoration biologist will provide technical, financial, and planning assistance to implement restoration activities on these private lands.

2.0 Project Background

Brackett Creek is a major tributary of the Shields River and supports pure, slightly hybridized, and potentially pure Yellowstone cutthroat trout (Figure 2-1). Approximately four miles of Brackett Creek flow through Lazy S Ranch located east of Clyde Park, Montana (Figure 2-2). The stream flows through pastureland and hay meadows. The riparian area supports willows, dogwood, alder, and a cottonwood gallery forest in some locations.

Pat Street, manager of the Lazy S Ranch initiated the contact with the LIP/YCT biologist. His interests included assessment of restoration activities completed on the ranch in 2003 and identification of additional projects to benefit the stream's fisheries. He was also seeking opportunities to promote community involvement in fisheries conservation on the ranch, especially in conjunction with the local chapter of the Future Farmers of America (FFA). MFWP welcomes opportunities to involve the public, particularly young people, in conservation projects.

Historically a working cattle ranch, current management objectives for the Lazy S Ranch emphasize wildlife and fisheries values. With the exception of a few elderly horses, livestock are absent from the ranch. Likewise, associated agricultural activities, such as production of irrigated forage crops, have not occurred in recent years. A large herd of elk (*Cervus elaphe*) commonly occupies the valley bottom and white-tailed deer (*Odocoileus virginianus*) are abundant. Creation of wetlands associated with restoration activities has likely enhanced waterfowl populations. Similarly, cessation of haying in the valley bottom has the intent of increasing cover for upland game birds.

In the early 2000s, the landowner initiated a large stream restoration project aimed at improving fisheries on reaches that had been significantly altered by past grazing practices and efforts to increase hay meadow acreage. A major component was re-naturalization of about 8,195 feet of Brackett Creek to its historic position through the middle of its valley by excavation of a new channel (Confluence 2003). Previous landowners had pushed the channel against its southern terrace, resulting in a steep,

armored reach of stream, which had low habitat quality including near absence of pools. The restoration action increased overall channel length by over 4,000 feet, and substantially increased habitat complexity with construction of pools, riffles, and runs. An added benefit of the channel relocation was that it eliminated a probable fish passage barrier caused by an irrigation diversion. Additional proposed work included stabilization of over 2000 feet of eroding bank combined with riparian plantings and removal of car bodies from stream banks in the lowest portion of stream. To date, these have not happened.

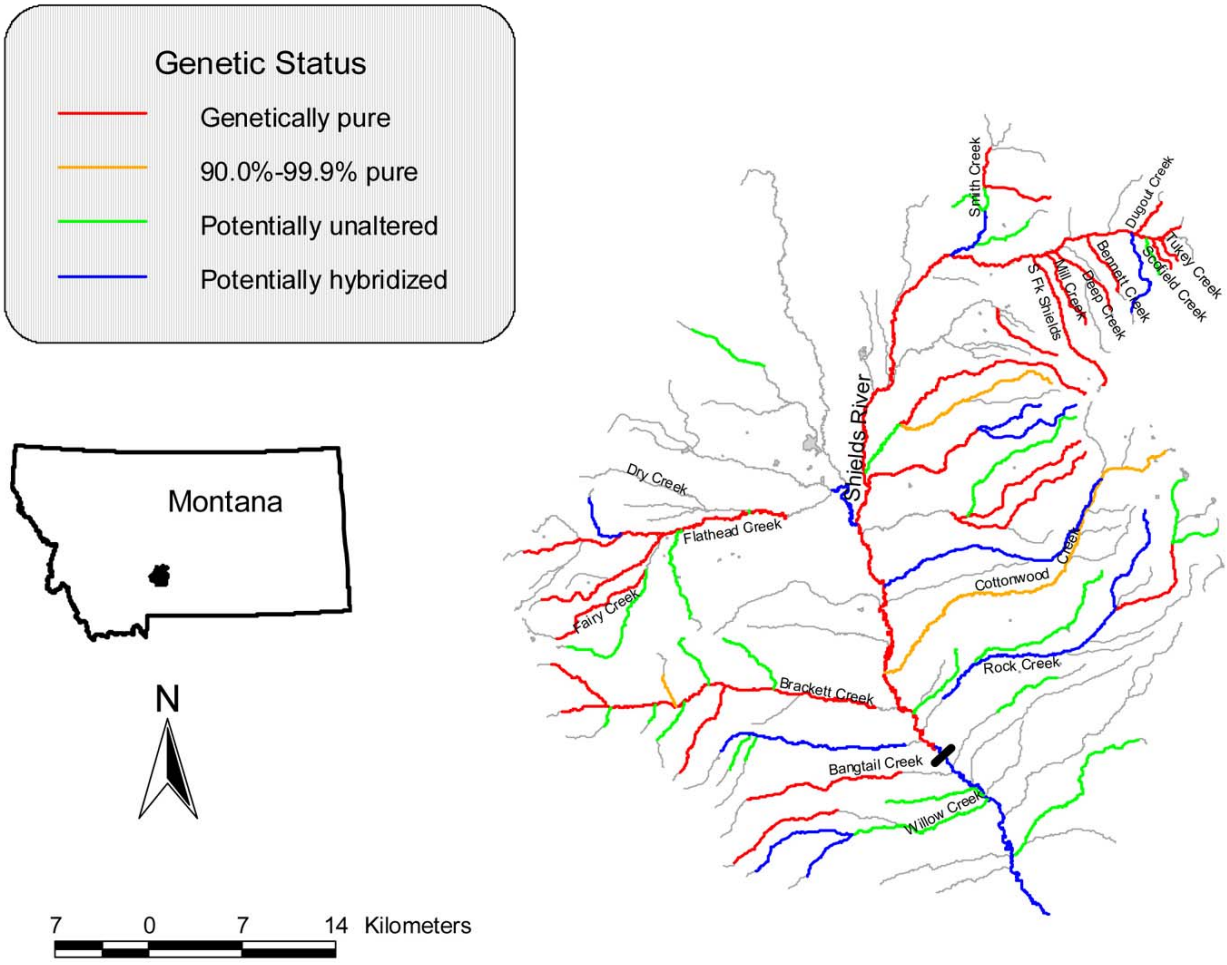

Figure 2-1: Map of the Shields River watershed showing distribution of Yellowstone cutthroat trout.

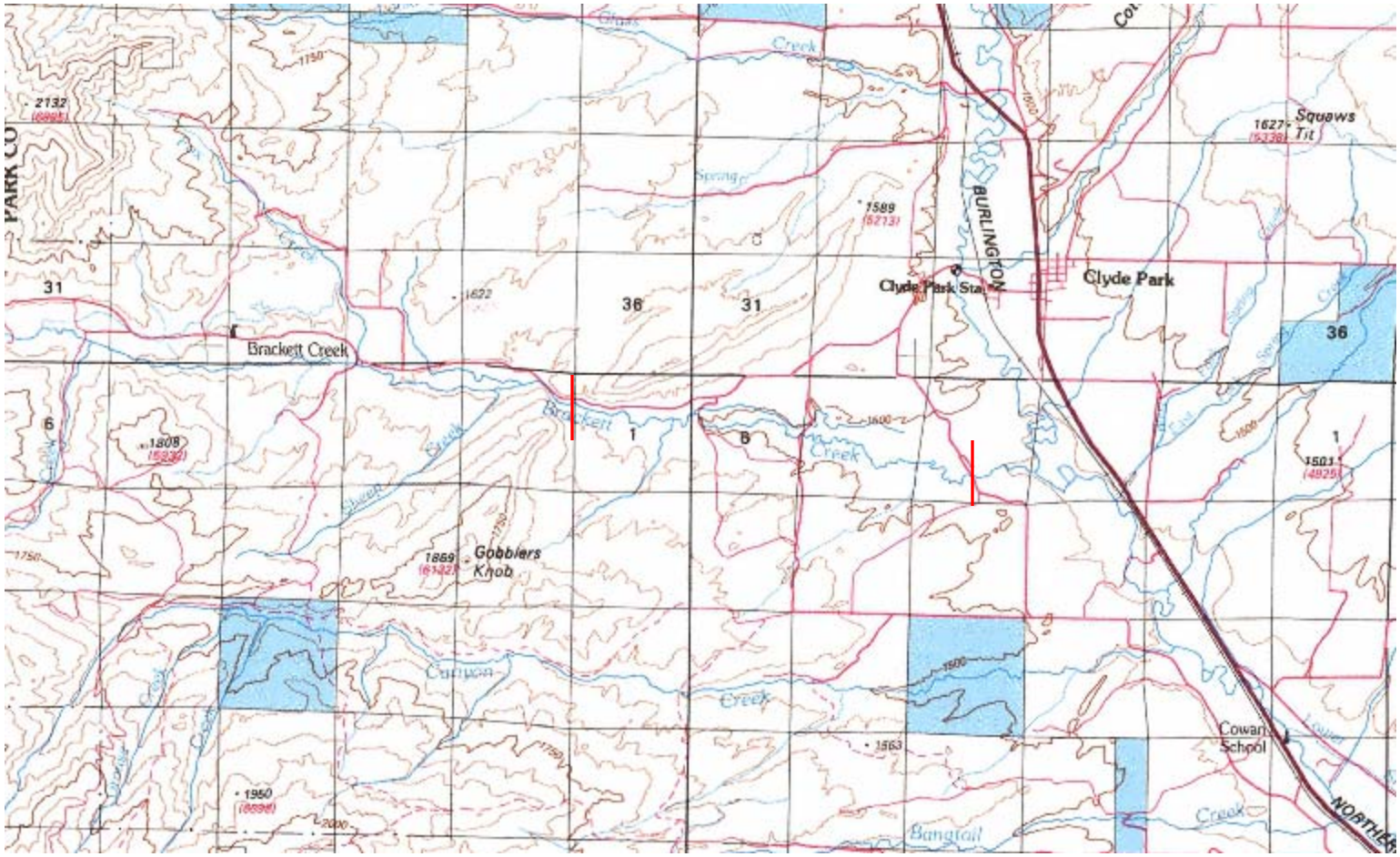

Figure 2-2: Brackett Creek – approximate boundaries of the Lazy S Ranch are in red.

3.0 Fisheries Data Review

Pertinent information for the Brackett Creek watershed comes from a variety of sources, including fish sampling reports and genetic evaluations. In addition, reports and grant applications associated with completed and planned restoration activities characterize conditions present before 2003. Another source of information is a draft conservation strategy for Yellowstone cutthroat trout in the Shields River watershed. The developing plan emphasizes promoting connectivity, reducing entrainment in irrigation ditches, improving and restoring habitat quality, and conducting studies to improve understanding of the life history strategies of Yellowstone cutthroat trout in the basin. These components of the draft plan informed the approach to field evaluations and development of recommendations.

Habitat descriptions within grant application materials describe a variety of perturbations on Brackett Creek within the Lazy S Ranch (Confluence 2003). Straightening the channel by placing it against the valley wall had occurred in several locations, with the reach above Canyon Creek Road being returned to its historic place on the floodplain (Figure 3-1 and Figure 3-2). In addition, removal of riparian shrub communities contributed to extensive lengths of eroding banks, some exceeding 15 feet in height. Stream straightening exacerbated channel erosion, as straightened streams have more power to exert erosive force on banks. Combined, these disturbances have a negative effect on fisheries by contributing fine sediment and decreasing habitat quality. Likewise, reduction in shrub cover increases summer water temperatures, which can result in temperatures that are stressful or even lethal to coldwater fish like trout.

Native fishes present in Brackett Creek include Yellowstone cutthroat trout, mountain whitefish (*Prosopium williamsoni*), lake chub (*Couesius plumbeus*), longnose dace (*Rhinichthys cataractae*), and mottled sculpin (*Cottus bairdi*) (Carson 2005, Confluence 2002, Shepard 2004). Introduced species include rainbow trout (*O. mykiss*), brown trout (*Salmo trutta*), and brook trout (*Salvelinus fontanalis*). Each of the non-natives presents a threat to the persistence of Yellowstone cutthroat trout in streams where they co-exist. Rainbow trout hybridize with Yellowstone cutthroat trout, which is the greatest overall cause for their decline (Kruse and Hubert 2000). Brook trout and brown trout tend to displace Yellowstone cutthroat trout when they co-occur through competition and predation (Gresswell 1988).

Baseline fisheries data collected in fall of 2002 characterized the composition and health of the fishery in the channelized reach and a downstream reach, which possessed better habitat quality (Confluence 2002, Figure 3-1). The downstream reach supported a higher density of trout and mountain whitefish. Brown trout was the most abundant species in both reaches. Yellowstone cutthroat trout and apparent hybrids were present in the upstream, channelized reach located above the diversion barrier; however, rainbow trout were only captured below the diversion. Mountain whitefish were the second most abundant fish in the lower reach, but were rare above the diversion dam. Overwhelmingly, mountain whitefish in Brackett Creek were juveniles, indicating this stream is an important spawning and rearing stream for this species. Their rarity above

the diversion structure suggests this was at least a partial passage barrier for mountain whitefish.

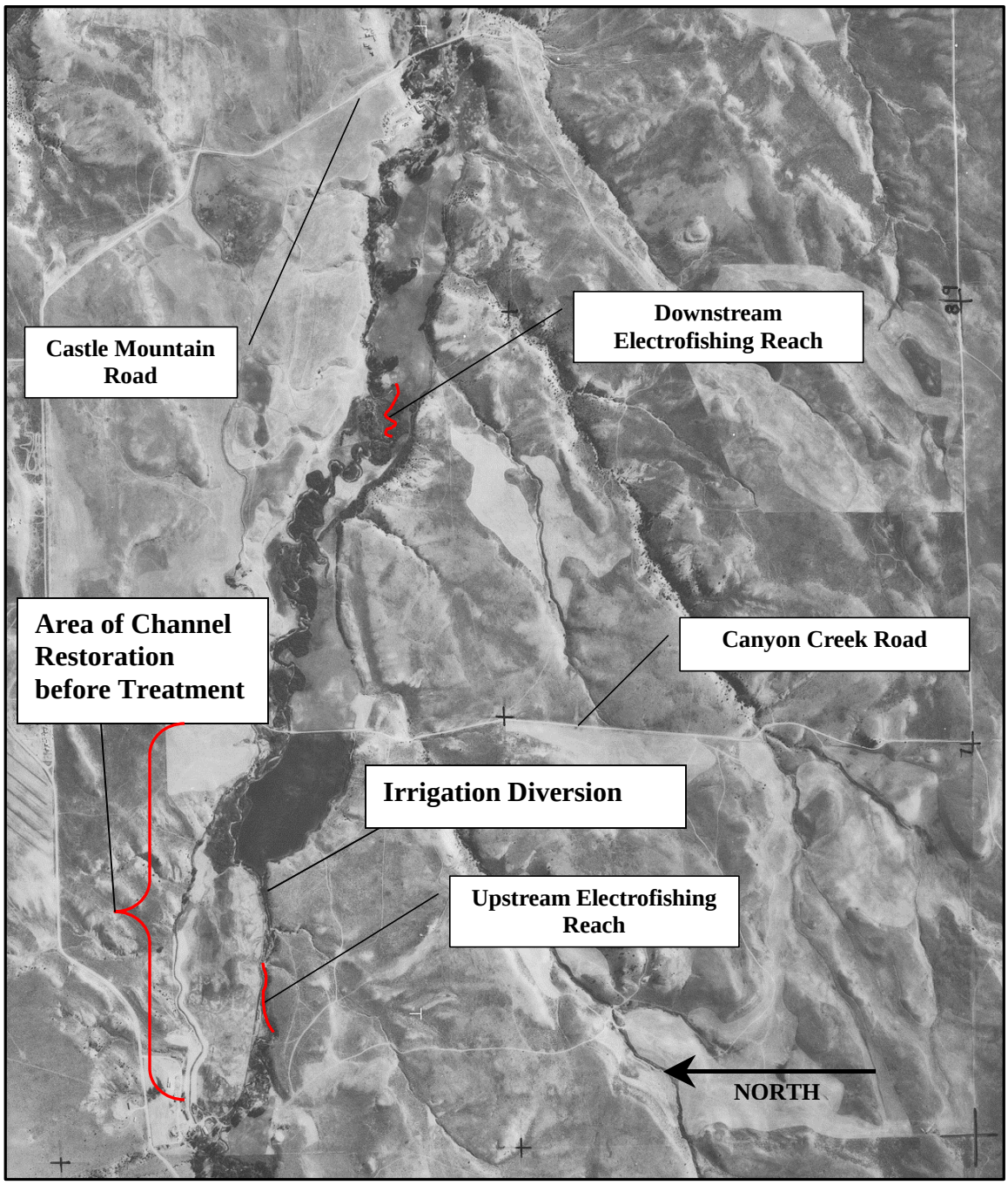

Figure 3-1: Fish sampling reaches on Brackett Creek (modified from Confluence 2002).

Figure 3-2: Aerial imagery from 2007 showing constructed/restored channel on Brackett Creek.

Evaluations of size class composition and condition factor (K), a measure of the plumpness of fish, allowed inference on the health of the fishery and potential limiting factors (Confluence 2002). With the exception of abundant juvenile mountain whitefish in the lower reach, young fish were rare in both reaches. Combined with field observations of excessive amounts of fine sediment on the streambed, these results suggest a lack of quality spawning habitat was a limiting factor in Brackett Creek. Comparison of K between the two assessed reaches indicated fish had higher condition in the lower reach. Presumably, the better quality of the habitat in the lower reach promoted increased productivity compared to the channelized reach resulting in greater density of healthier fish.

Genetic evaluations of Yellowstone cutthroat trout in Brackett Creek found evidence of introgression or hybridization with rainbow trout (Cook 2002). Specifically, one of the 19 fish tested showed rainbow trout alleles typical of an F1 generation. In other words, this fish was likely the result of the pairing of a pure Yellowstone cutthroat trout with a pure rainbow trout. Likewise, the 2002 sampling effort identified apparent Yellowstone cutthroat trout × rainbow trout hybrids in the downstream sampling section.

Several components of the draft conservation strategy for Yellowstone cutthroat trout have particular relevance for restoration activities on Brackett Creek through the Lazy S Ranch. Specifically, the draft strategy calls for promoting connectivity throughout the basin, and collection of baseline data and post-restoration monitoring data to evaluate the ecological response. The pre-restoration fisheries data, combined with future fisheries assessments, will allow evaluation of the influence of channel restoration on fish populations. Likewise, comparisons of fish community composition before and after elimination of the barrier formed by the irrigation diversion will allow evaluation of potential invasion of non-native salmonids. These results will inform restoration planning in other Yellowstone cutthroat trout streams.

4.0 Site Visit

On May 22, 2007, I visited the Lazy S Ranch, accompanied by Pat Street and Daryl Shehan, chairperson of the Shields Valley Watershed Group. Our objectives were to evaluate habitat conditions, identify limiting factors and potential projects, and discuss opportunities to monitor biological response to completed restoration activities.

Our first stop was a constructed pond on the upper end of the property. Currently, this pond is fishless. A search of the fishpond license database yielded no permits to place fish in this pond under either the landowner's name nor Lazy S Land and Livestock. Obtaining a fishpond license requires completion of an application available on MFWP's website (http://fwp.mt.gov/fishing/regulations/ponds.html). The application details conditions required by both MFWP and the Department of Natural Resources (DNRC) for issuance of a pond permit. Scott Opitz, the local fisheries manager, can answer questions regarding requirements for pond permits (222-5105).

Next, we viewed the constructed channel occupying the floodplain upstream of Canyon Creek Road. Overall, this restored reach represents a striking improvement from conditions in its former location. Its current configuration is a meandering channel with a pool/riffle sequence lined with predominantly stable and undercut banks (Figure 4-1 and Figure 3-2). The deep pools had gradual tail outs providing ideal sized substrate for spawning. In contrast, riffles dominated the former channel with pools being rare and of low quality. Likewise, cobbles dominated the streambed in its former location and provided little suitable spawning habitat. The new channel provides superior habitat for all life history stages, including spawning, and has vastly improved overwintering habitat compared to the former channel.

Figure 4-1: View of the constructed channel in the upper reach of Brackett Creek on the Lazy S Ranch. (Blotches on the photo are raindrops related to cool, wet weather).

Although the majority of the banks were stable, bank erosion was present on some outer meander bends (Figure 4-2). Erosion was likely the result of a rain-on-snow event that occurred the spring following completion of the new channel. This flood had a calculated recurrence interval of 85 years (Matt Klara, water resources engineer, personal communication). Given the magnitude of the event, and the early stage of vegetative recovery, the new channel withstood this flood remarkably well. Dissipation of flood flows over the floodplain contributed to a decrease in the erosive force of floodwaters. Moreover, improved access to the floodplain, compared to the former channel location, likely lessened the impact of flooding in the reaches below.

Despite a lack of livestock grazing, recovery of willows in the restored reach has lagged. Willow clumps installed during restoration had high mortality. Planting occurred in an exceptionally hot summer, and even with irrigation, the stress may have been overwhelming. Recruitment of willows has likewise been slow. The existing sandbar willow (*Salix exigua*) shows evidence of heavy browse pressure, which is likely attributable to the large number of elk using the area. Augmenting the existing willow community with conservation plantings would likely be futile without a reduction in elk numbers.

Figure 4-2: Example of localized bank erosion in the constructed channel related to the flood event that occurred in the spring following construction.

Following evaluation of the restored reach, we viewed stream and riparian conditions in the lower end of the ranch. Previous owners had grazed the stream corridor heavily, resulting in substantial reduction of riparian shrub cover and extensive lengths of eroding bank (Figure 4-3). Despite several years of rest from livestock, banks have not recovered and are still contributing fine sediment to Brackett Creek and ultimately the Shields River. Similar to the upstream reach, wildlife browse pressure has likely prevented recovery of riparian shrub communities.

Eroding banks have apparently been a long-term problem on this portion of Brackett Creek. Earlier attempts to stabilize banks included use of car bodies (Figure 4-4). A cursory count indicated over 20 cars used as riprap, most of which were 1940s through 1950s vintage. This approach to bank stabilization has been illegal since the 1970s, with passage of the Montana Natural Streambed and Land Preservation Act or 310 law.

Figure 4-3: Example of bank erosion on the lower reaches of Brackett Creek on the Lazy S Ranch.

Figure 4-4: Example of car bodies used as bank armor on the lower portion of Brackett Creek on the Lazy S Creek.

5.0 Conclusions and Recommendations

Current conditions on Brackett Creek flowing through the Lazy S Ranch vary, with restoration activities being responsible for markedly improved habitat in some portions of the stream. Bank erosion and relatively low riparian shrub cover remain in reaches not subjected to restoration, despite nearly 10 years of rest from livestock grazing. Browse

pressure from wildlife is likely a factor contributing to slow recovery of riparian shrub communities.

The channel restoration project is notable in terms of its extent and apparent success. The landowner paid for much of this work, and is to be commended for his contribution towards conservation of Yellowstone cutthroat trout in Brackett Creek. Public funds, including MFWP's Future Fisheries Improvement Program and the US Fish and Wildlife Service's funds promoting fish passage, also contributed to restoration. Visual inspection of the restored reach confirms the appropriateness of the investment of public funds given the marked improvement in fish habitat.

The conservation strategy for Yellowstone cutthroat trout for the Shields River watershed emphasizes monitoring to evaluate the effect of restoration on Yellowstone cutthroat trout and allow for modification of the restoration approach as warranted. Baseline fisheries information will prove invaluable in assessing the response of Yellowstone cutthroat trout and other species to habitat improvements and elimination of the irrigation diversion as a fish barrier. To control for seasonality, fish should be sampled in fall, as the previous effort occurred in mid-November. Fish should be sampled in the same downstream reach as in 2002. Of course, a new sampling reach will need to be established within the constructed channel.

The conservation strategy for Yellowstone cutthroat trout also identifies a lack of understanding on habitat use and movements of Yellowstone cutthroat trout as an impediment in its conservation in the Shields River watershed. Conducting redd counts and additional fish sampling in late spring would allow identification of Yellowstone cutthroat trout spawning areas and identify seasonal use of Brackett Creek by Yellowstone cutthroat trout and other species.

Bank erosion is a significant issue along much of Brackett Creek, both within and above the Lazy S Ranch. Accumulation of excessive amounts of fine sediment on the streambed harms fish by reducing invertebrate production and suffocating redds. Already, the adjacent, upstream landowner has initiated projects to reduce sediment loading on his property (Figure 5-1). Other upstream landowners have expressed interest in implementing such projects. If redd counts indicate significant amounts of spawning occur in Brackett Creek within the Lazy S Ranch, collection of substrate cores quantifying amounts of fine sediment will be useful in evaluating the effect of upstream bank stabilization projects.

Figure 5-1: Example of a bank stabilization project on an upstream neighbor's property on Brackett Creek.

Options to stabilize eroding banks vary with severity of the bank erosion and the potential for natural recovery. Often banks may heal with reduced pressure from livestock grazing, in conjunction with conservation plantings; however, banks on the Lazy S Ranch have failed to stabilize despite several years of rest. Alternatively, some banks may benefit from mechanical stabilization such as is displayed in Figure 5-2. This "soft" approach to bank stabilization capitalizes on the stabilizing function of riparian vegetation, along with a stable bank geometry. Figure 5-1 presents a variation on this approach with use of cottonwood logs wired into the toe of the bank. This can be a cost-effective approach as fallen cottonwoods are locally available. Moreover, cottonwoods are a natural feature on Brackett Creek, making this an appropriate option.

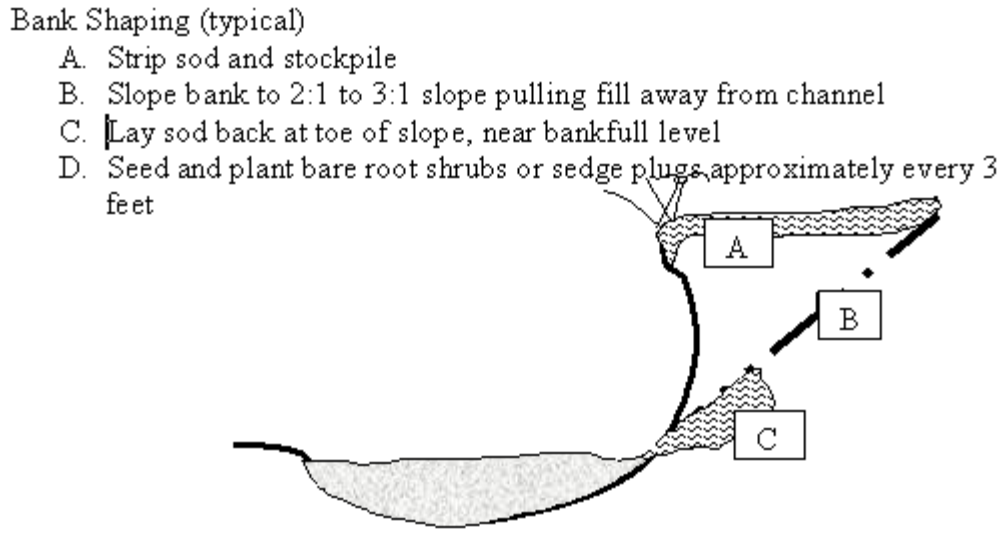

Figure 5-2: Conceptual approach to stabilizing vertical eroding banks.

In summary, the Lazy S Ranch presents an excellent example of a successful restoration project, although untreated reaches have impaired habitat quality and are sources of fine sediment, which has a negative effect on fish and aquatic life. Moreover, warm summer water temperatures result with a reduction in shading. Recommendations include stabilizing stream banks using appropriate methods that emphasize establishment of vegetation. In addition, follow up monitoring will be useful in evaluating the response of fish populations to past and future restoration activities on Brackett Creek.

6.0 Literature Cited

Carson, S. 2005. 2005 MFISH database reference. MFWP, Helena, Montana.

Confluence. 2003. Future fisheries improvement plan grant application. Prepared for Future Fisheries Improvement Plan, Montana Fish, Wildlife & Parks, Helena, MT

Confluence. 2002. Fisheries investigations on Brackett Creek through the Lazy S Ranch. Report prepared for private client and MFWP. Confluence, Bozeman, Montana.

Cook, M. 2002. Genetic letter to Lee Nelson. University of Montana.

Gresswell, R. E., editor. 1988. Status and management of interior stocks of cutthroat trout. American Fisheries Society Symposium 4, Bethesda, Maryland

Kruse, C., and W.A. Hubert. 2000. Status of Yellowstone cutthroat trout in Wyoming waters. North American Journal of Fisheries Management 20:693-705

Rosgen, D.1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, Colorado.

Shepard, B.B. 2004. Fish surveys of the Shields River tributaries; 2001 through 2003. Montana Department of Fish, Wildlife, and Parks, and Montana Cooperative Fisheries Research Unity. Montana State University, Bozeman.