South Fork Horse Creek Fish Passage, Habitat Enhancement, and Entrainment Prevention

Initial Project Assessment

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1.0 Introduction

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 a potential project on South Fork Horse Creek, a small stream within a tributary drainage to the Shields River near Wilsall, Montana. The objectives of the project assessment are to describe 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

South Fork Horse Creek flows to the west from the foothills of the Crazy Mountains until its confluence its main stem, a tributary of the Shields River downstream from Wilsall (Figure 2-1). The property in question lies in T3N R9E Section 24, and encompasses a reach of South Fork Horse Creek that flows under Horse Creek Road in two locations (Figure 2-2).

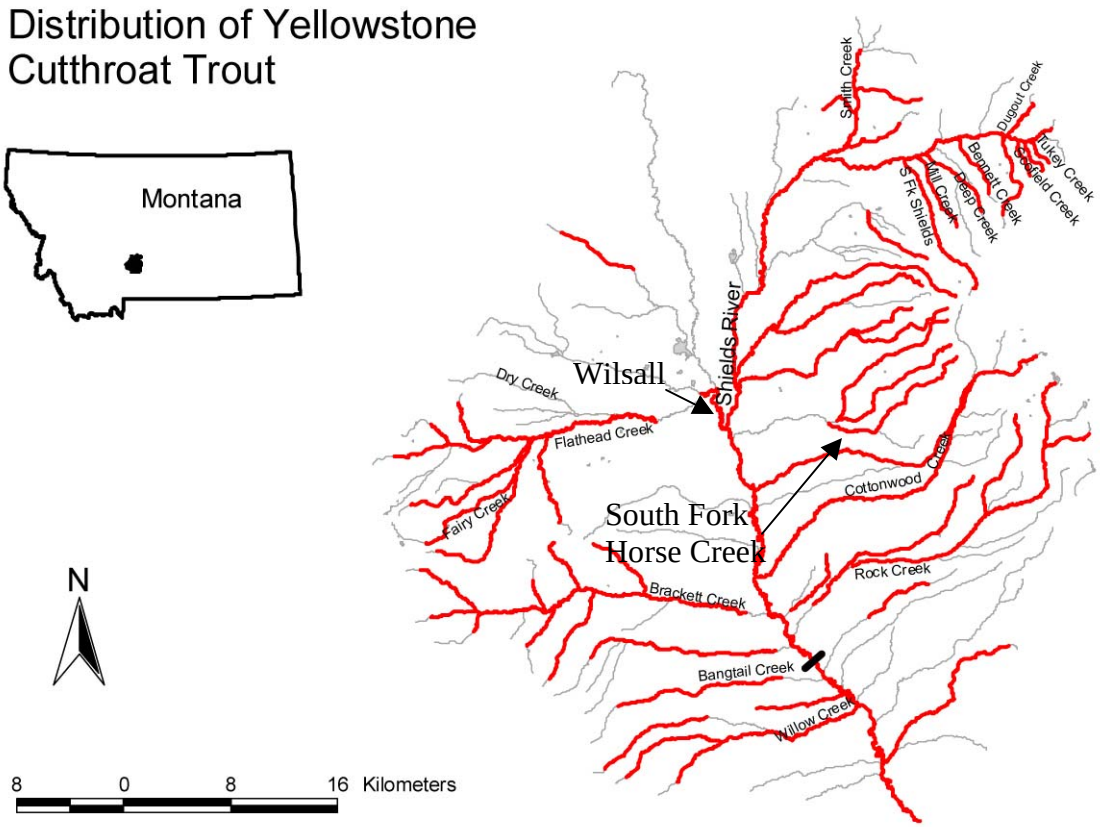

Figure 2-1: Map of the Shields River watershed showing location of South Fork Horse Creek.

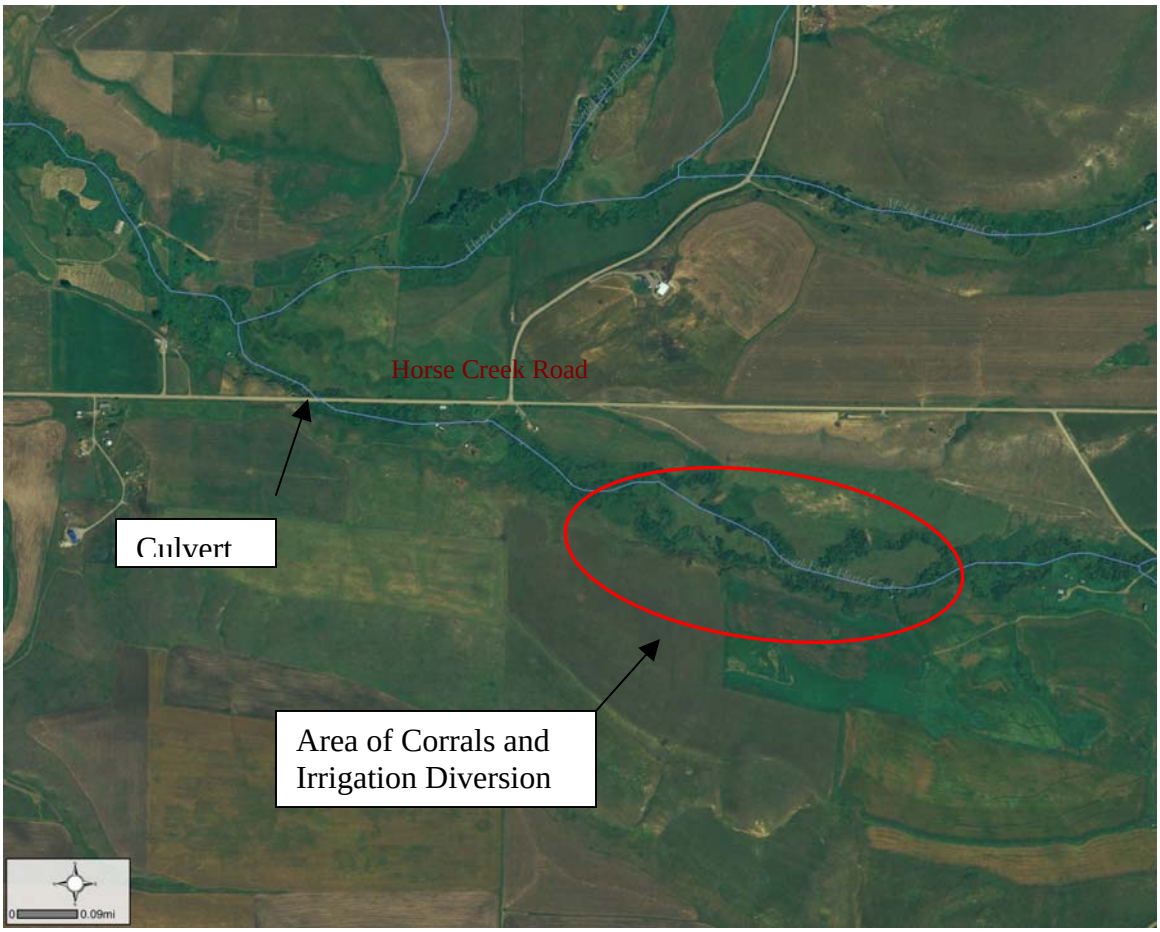

Figure 2-2: Aerial view of project area.

The referral for this potential project came through Dewitt Dominick of Oasis Environmental, who has been providing environmental planning, design, and permitting services to Brumfield Land and Livestock, owner of the property. This property is a working cattle ranch, and has recently come under new ownership. Objectives for the property include maintaining agricultural economic viability while promoting natural resource values, such as fish and wildlife. Primary reasons for the field visit were to evaluate fish passage through a culvert at a county road, and determine potential restoration activities to benefit Yellowstone cutthroat trout associated with corrals and an irrigation diversion on this reach of stream.

3.0 Fisheries Data Review

The Shields River drainage is a stronghold for Yellowstone cutthroat trout, and is rare among watersheds supporting this species, as Yellowstone cutthroat trout occur throughout the entire drainage. In contrast, a common distributional pattern elsewhere in the native range of this fish is for Yellowstone cutthroat trout to be relegated to headwater portions of streams. The abundance and widespread distribution of

Yellowstone cutthroat trout within the Shields River watershed makes this an important area in native species conservation.

Currently, a conservation strategy for Yellowstone cutthroat trout is under development for the Shields River basin that emphasizes connectivity, reducing entrainment in irrigation ditches, and improving and restoring habitat quality. Promoting connectivity is crucial in managing the Shields River Yellowstone cutthroat trout as a metapopulation, or set of spatially segregated populations that interact on some level. Maintaining gene flow among populations, and allowing colonization of areas where localized disturbance has extirpated a given population, are key considerations in managing the Shields River watershed's Yellowstone cutthroat trout.

Fisheries data for South Fork Horse Creek are limited to tissue analyses to evaluate the genetic purity of Yellowstone cutthroat trout in this stream (Leary 1992). At all diagnostic loci, only alleles characteristic of Yellowstone cutthroat trout were detected; however, a small sample size limited the certainty associated with results making slight introgression from westslope cutthroat trout or rainbow trout a possibility. Nonetheless, pending collection of additional data, this population is to be managed as a pure Yellowstone cutthroat trout population.

Fish surveys conducted in Shields River streams draining from the Crazy Mountains provide additional insight into the potential for South Fork Horse Creek to support Yellowstone cutthroat trout (Tohtz 1999). Yellowstone cutthroat trout were the most common species captured in sampled streams, which included Horse, Porcupine, South Fork Elk, and Cottonwood creeks. Moreover, Yellowstone cutthroat trout abundance was exceptionally high in all these streams, equaling or exceeding densities found in the main stem Yellowstone River. These results emphasize the importance of these east basin streams in providing substantial habitat for Yellowstone cutthroat trout.

Another informational gap relating to this potential project is a lack of understanding of seasonal movements and habitat use by Yellowstone cutthroat trout in the Shields River watershed. Information on timing of movements and size classes of fish making seasonal migrations is important in design specifications to ensure fish passage. For example, investigations of seasonal movements and habitat use of the closely related westslope cutthroat trout found fish moved considerable distances to access spawning, summer, and overwintering habitat (Magee 1993, Ireland 1993). Without an understanding of fish migration patterns in the Shields River watershed, fish passage requirements should allow for passage of all sizes through a range of flows.

4.0 Site Visit

On March 16, 2007, Dewitt Dominick and I visited the site to evaluate potential for developing projects to benefit Yellowstone cutthroat trout. Most effort focused on evaluation of on site conditions, such as the existing habitat and proximate culverts. However, we also made cursory evaluations at road crossings encountered as we traveled to the site.

4.1 Culverts/Fish Passage

Ensuring fish passage is a concern in managing the Shields River drainage Yellowstone cutthroat trout as a metapopulation. Field investigations included cursory evaluation of culverts at all road crossing encountered along Horse Creek and its forks. The culvert at the lower end of the Brumfield property received the most scrutiny, and is likely the worse case scenario among culverts in the Horse Creek drainage.

Readily identifiable characteristics that suggest this culvert blocks fish movement include its steep gradient and length. Coarse field measurements suggested the pipe has an 8% slope over its 70 ft length. Within the pipe, the slope varies, as the upper few feet has a steeper slope owing to accumulation of debris (Figure 4-1). The combination of high slope and considerable length probably makes this culvert a passage barrier at most, if not all, flows.

Figure 4-1: Culvert presenting a probable fish barrier on the lower end of the Brumfield property.

The other culverts examined were more favorable for fish passage. These culverts were typically shorter and less steep. Nonetheless, these may present barriers to some size classes at variable flows. Some had plunge pools, which would require leaping, followed by burst swimming to allow passage through the culvert. Application of a standardized approach to evaluating fish passage potential is a recommendation for each road crossing in the Horse Creek drainage.

4.2 Habitat

Much of the reach of South Fork Horse Creek flowing through the Brumfield property occupies an old corral where heavy use by livestock has contributed to channel alterations and riparian degradation. This approximately 500 ft long stretch of channel is

overly wide, and has reduced cover of riparian shrubs (Figure 4-2). In addition, the stream abuts a terrace at one location, which is a source of fine sediment to this stream, and ultimately the Shields River (Figure 4-3). Outside the heavily used corral areas, dense shrub cover and a graminaceous understory maintain a narrower, deeper channel, along with associated benefits of stream shading and improved sediment transport (Figure 4-4).

Figure 4-2: Typical view of South Fork Horse Creek where it flows through corrals.

Figure 4-3: Eroding bank contributing fine sediment to South Fork Horse Creek.

Figure 4-4: Riparian and channel conditions outside of heavily grazed corrals

4.3 Irrigation Diversion

An irrigation diversion was another feature observed on this property. When in operation, fish likely have full access to the ditch through a slide or Waterman gate (Figure 4-5). Entrainment of Yellowstone cutthroat trout into irrigation ditches has an unknown, yet potentially significant population level effect in the South Fork of Horse Creek.

Figure 4-5: Irrigation diversion on South Fork Horse Creek.

5.0 Conclusions and Recommendations

This property presents several opportunities to promote conservation of Yellowstone cutthroat trout, and is an appropriate candidate for assistance through the Landowner Incentive Program. Nonetheless, additional information is warranted to evaluate the potential benefit and justify associated costs.

Initial evaluations of the culvert under Horse Creek road at the downstream end of the Brumfield property suggest it presents a total to partial barrier to fish passage, especially for smaller fish. Nevertheless, several road crossing occur downstream of this barrier with an unknown potential to block fish movement. The observed culverts are less steep and not as long, which are factors promoting fish passage. Still, the considerable expense associated with modifying or replacing the existing culvert necessitates evaluation of the others. If these are impassable, then the investment on the culvert in question is not justifiable. Therefore, systematic evaluation of these road crossings using a standard approach to evaluate fish passage should occur before proceeding with the current project. As Horse Creek flows through multiple land holdings, involving the Shields Valley Watershed Group is advisable to promote outreach and involvement of other private landowners.

Cost is another consideration associated with replacement or modification of this and other culverts to promote fish passage. Horse Creek Road is a county road; however, Park County does not have sufficient funds to implement the necessary modifications. MFWP's LIP-YCT biologist can assist in acquiring grants to finance this effort.

The reach of South Fork Horse Creek flowing through the corrals would benefit from implementation of grazing best management practices to facilitate recovery of habitat. Grazing management practices that control livestock's access to the stream, installation of hardened access points for stock watering, or development of off stream water sources are among the management alternatives. Entities available to assist in the development of a site-specific approach to manage livestock use of the area include MFWP's LIP-YCT and the Natural Resource Conservation Service's district conservationist.

Although a change in grazing management will affect recovery of riparian condition and stream habitat through the corral section of stream, mechanical habitat restoration can expedite this process. Adjacent reaches not subjected to such intense grazing provide excellent internal references for desirable channel dimensions. Moreover, dense willow stands neighboring the site afford a local source of shrubs.

Treating the eroding bank within the corrals is also desirable. Figure 5-1 illustrates a conceptual approach to stabilizing banks of this type. Essentially, this method emphasizes restoration the stable bank geometry and the promotion of the functional attributes of riparian vegetation in maintaining bank stability. Associated benefits include improved water quality through shading of the stream and increasing bank line roughness, which will trap fine sediment, thereby reducing siltation.

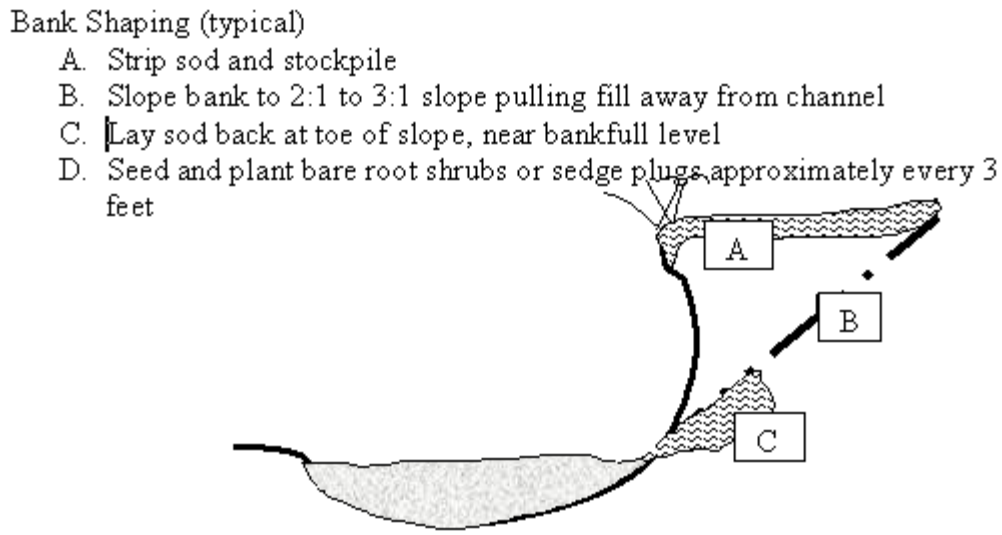

Figure 5-1: Conceptual approach to stabilizing steep eroding stream banks.

Financial assistance is often available for implementation of grazing management activities and habitat restoration. Nonetheless, most granting institutions encourage or require an in-kind match of some proportion of the entire project costs. As costs associated with culvert replacement or modification will likely be substantial, landowner contributions through developing infrastructure to support grazing management or habitat restoration may contribute to the in-kind match requirements. Once again, the LIP-YCT biologist can assist in estimating costs associated with all portions of this project and developing alternatives in determining in-kind match.

Two options exist for preventing or reducing entrainment of Yellowstone cutthroat trout in to the irrigation ditch on this property. Following MFWP guidance on shutting down ditch operations is the least intensive approach. Essentially, this calls for staggering shutdown over three days. The gradual decline in flow will cue fish to move upstream and out of the irrigation ditch. Maintaining the ditch so that it lacks refugia such as pools or boulders is an important corollary activity to this approach.

An alternative to managing cessation of ditch operations is installation of a fish screen that allows delivery of water while blocking fish entrainment. Several options are available including coanda screens, rotating drum screens, and turbulent fountains. In addition, grant funds are available through several sources for installation of these effective solutions to fish loss. Evaluation of fish entrainment at the existing head gate is needed to justify costs.

In conclusion, the property presents several opportunities to enhance and conserve Yellowstone cutthroat trout in South Fork Horse Creek and the larger Shields River watershed. In the event that the landowner is interested in proceeding, the following are the next logical activities:

- Assess potential fish passage using a standard methodology at all road crossings from the mouth of Horse Creek to its headwaters.

- Develop conceptual design and initial cost estimate for culvert replacement or modification as needed.
- Work with landowner to develop a livestock grazing strategy that accommodates needs for forage and stock water while protecting stream banks, channel, and riparian vegetation.
- Develop a conceptual plan and initial cost estimate for stream restoration and bank stabilization.
- Evaluate fish loss through the existing head gate.
- Work with landowner to develop an appropriate approach to reducing or eliminating fish entrainment (staggered shut down or fish screen).
- If selected, develop a conceptual plan and initial cost estimate for installing a fish screen.
- Apply for grants to fund restoration and enhancement activities.

6.0 Literature Cited

Ireland, S.C. 1993. Seasonal distribution and habitat use of westslope cutthroat trout in a sediment-rich basin in Montana. Master's thesis. Montana State University, Bozeman, Montana.

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Tohtz, J. 1999. Fisheries Investigations In The Yellowstone And Shields River Basins, Park County, Montana: Annual Report For 1999; December 1999. F-78-R-4 [F-78-R-5] | [F-78-R-6]