Emigrant Spring Creek Monitoring

Redd Counts 2007

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1.0 Introduction

Emigrant Spring Creek, a small tributary of the Yellowstone River, has been the subject of several actions aimed at restoring the resident fishery and increasing recruitment of trout to the Yellowstone River. Improvements in irrigation efficiency decreased the amount of water used, while maintaining crop production and enhancing spring creek flows through irrigation returns. Additions to ranch infrastructure, such as riparian fencing and development of off-channel water sources, have decreased livestock grazing pressure on riparian vegetation and improved stream bank stability. Stream channel restoration converted overly wide and shallow reaches, which had accumulated over a foot of fine sediment, to a narrow, deep, meandering channel capable of transporting its sediment load. Combined, these actions improved habitat quality for all life history stages of salmonids and other members of the native fish assemblage using this small stream.

A primary objective of restoration on Emigrant Spring Creek was to provide spawning habitat and establish a run of migratory Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri*) to augment this declining species in the Yellowstone River. Yellowstone cutthroat trout are native to the Yellowstone River, but are now outnumbered by introduced rainbow trout (*O. mykiss*) and brown trout (*Salmo trutta*). Yellowstone cutthroat trout have apparently made sporadic use Emigrant Spring Creek for spawning, although not in large numbers. Berg (1975) captured two spawning Yellowstone cutthroat trout in Emigrant Spring Creek in 1975, while investigations in the mid 1980s found no evidence of a Yellowstone cutthroat trout spawning run in Emigrant Spring Creek (Clancy 1984, Clancy 1985). Similarly, adult trapping intended to capture rainbow trout spawners yielded no fish in the 1980s (Clancy 1984). Shepard (1992) counted six redds in Emigrant Spring Creek and attributed this to efforts to imprint Yellowstone cutthroat trout fry on this stream. Low flows and sedimentation likely made this stream marginal for Yellowstone cutthroat trout reproduction before the recent improvements

This report documents results of post-restoration monitoring to determine use of Emigrant Spring Creek for use by spawning rainbow trout (O. *mykiss*) and Yellowstone cutthroat trout. Although both spawn in the spring, some temporal segregation occurs, which has allowed genetically pure Yellowstone cutthroat trout to coexist with rainbow trout (DeRito 2005). Rainbow trout tend to spawn earlier, coinciding with the rising limb of the Yellowstone River's spring run off. In contrast, Yellowstone cutthroat trout spawning concentrates with the declining limb of the spring hydrograph. Although some overlap occurs, which results in hybridization, this temporal asynchrony is sufficient to maintain a population of genetically pure Yellowstone cutthroat trout in the upper Yellowstone River. Although this monitoring attempt does not allow fisheries managers to discriminate between rainbow trout and Yellowstone cutthroat trout spawning, it does permit inference on the suitability of habitat in Emigrant Spring Creek to support spawning by fluvial salmonids.

A secondary objective of this report is to evaluate the effectiveness of conservation practices in Emigrant Spring Creek with respect to improving habitat and water quality.

Observations of current conditions, along with comparisons to pre-project photos, allowed inference on the influence of project activities on riparian health, stream morphology, and water quality.

2.0 Methods

On June 19, 2007, FWP's Yellowstone cutthroat trout restoration biologist walked the length of Emigrant Spring Creek to document presence of redds and evaluate riparian and stream channel conditions following implementation of restoration and grazing management changes. Redds and digs, apparent attempts at redds, were mapped using a handheld global information systems (GPS) unit. Qualitative observations, which were augmented by photos, allowed evaluation of the effect of restoration and livestock management on riparian vegetation and channel morphology.

3.0 Results and Discussion

3.1 Redd Counts

Nine redds and seven digs were apparent on June 19, 2007, with most redds clustered within a small reach of stream (Figure 3-1). Although only nine distinct redds were observed, these probably reflect the activity of considerably more spawning fish. Several redds were large, with lengths and widths sometimes exceeding eight feet (Figure 3-2). By comparison, an investigation of Yellowstone cutthroat trout redds in Idaho found they averaged 5 by 2 feet (Thurow and King 1994). Large dimensions of some redds in Emigrant Spring Creek suggest superimposition of several redds at one location.

Distinguishing rainbow trout and Yellowstone cutthroat trout redds from the available data is problematic. Moreover, some redds may reflect spawning between rainbow trout and Yellowstone cutthroat trout, an undesirable occurrence leading to hybridization. Given the disparity in timing between the height of the rainbow trout and Yellowstone cutthroat trout spawning periods, the apparent age of redds allows inference on which species is using Emigrant Spring Creek for spawning. The large redd featured in Figure 3-2 was dug relatively recently, as evidenced by the lack of periphyton colonizing gravel surfaces and generally cleaner appearance. In contrast, the redd in Figure 3-3 is likely older as the gravel is less clean and has begun to support algae. The apparent variable ages of redds in Emigrant Spring Creek suggests both Yellowstone cutthroat trout and rainbow trout are using this stream.

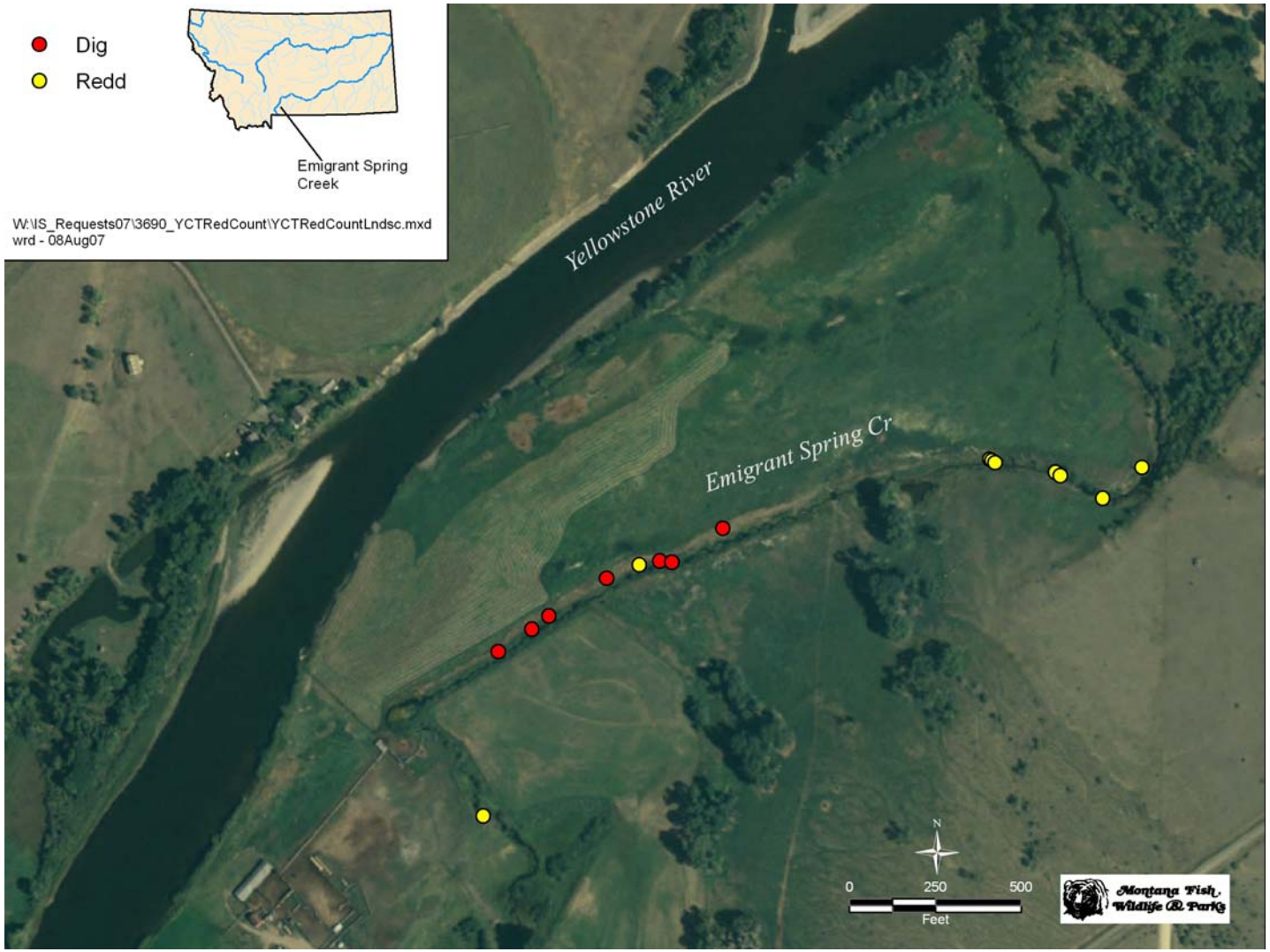

Figure 3-1: Distribution of redds and digs, apparent attempts at redds, identified on Emigrant Spring Creek, June 19, 2007.

Figure 3-2: Large redd on Emigrant Spring Creek, which is likely the result of more than one spawning pair.

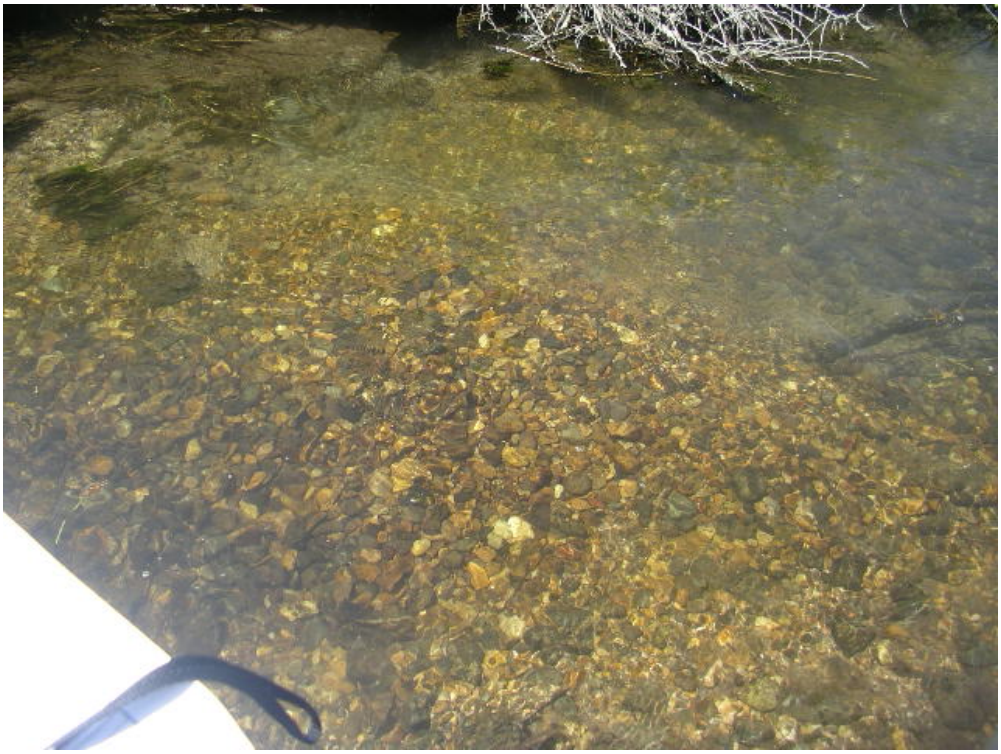

Figure 3-3: Older redd with less recently disturbed gravel.

3.2 Habitat Observations

Observations of current habitat condition, combined with review of pre-project photos, indicate marked improvements in riparian health and vigor, and instream habitat on Emigrant Spring Creek. Pre-project photos show a wide and shallow stream channel with poor sediment transport capabilities and impaired riparian health and function (Figure 3-4 and Figure 3-5). Conditions in June of 2007 were in marked contrast to pre-restoration conditions (Figure 3-6). Riparian vegetation was robust with herbaceous and woody vegetation providing shade and overhead cover. The stream channel was narrow and deep, which provided better habitat to resident fish. The improved sediment transport capacity of the restored channel prevented accumulation of fine sediment on the streambed increased the suitability of this stream for spawning by trout, including the sensitive Yellowstone cutthroat trout.

Figure 3-4: View of riparian condition, stream morphology, and suspended sediment in Emigrant Spring Creek before restoration (2004) .

Figure 3-5: Wide and shallow stream channel typical of much of Emigrant Spring Creek before restoration (2004).

Figure 3-6: Post-restoration view of Emigrant Spring Creek showing well vegetated banks and recovering shrub community on June 19, 2007.

4.0 Conclusions

Redd counts and habitat observations indicate the Emigrant Spring Creek restoration project was successful in meeting its objectives. The number, size, and apparent age of redds indicate this stream is supporting a Yellowstone cutthroat trout spawning run, as well as a rainbow trout run. Similarly, riparian vegetation, stream habitat, and water quality have improved substantially from restoration conditions.

Conservation projects of this magnitude typically involve investment from a number of entities. Funding for this project came from a variety of state and federal sources, as well as substantial contributions from the landowners (Table 4-1). The strength of the spawning run in Emigrant Spring Creek, within just two spawning seasons after completion of the project, is an indicator of the project's success. The benefits will extend beyond Emigrant Spring Creek, by increasing recruitment of Yellowstone cutthroat trout to the Yellowstone River. This increases the fish's chances of persisting in the Yellowstone River and provides anglers with a unique experience to catch wild, native Yellowstone cutthroat trout. The conservation and recreational benefits to the larger river system justify the project expenditure and use of public funds.

Table 4-1: Breakdown of funding sources for the Emigrant Spring Creek restoration project (from the Future Fisheries Improvement Program application 2003)

Source	***Program***	***Amount***
Landowner's contributions		$25,880
FWP[1]	Future Fisheries Improvement Program	$18,969
DNRC[2] through Park CD[3]	HB223 Grants	$7,200
NRCS[4] & DNRC through Park CD	Resource Planning Grant	$9,000
NRCS	EQIP	$49,503
Total Project Cost		$110,552

[1] Montana Fish, Wildlife & Parks
[2]Department of Natural Resources Conservation
[3]Park Conservation District
[4]Natural Resources Conservation Service

Maintaining the genetic integrity of Yellowstone cutthroat trout is a major concern for fisheries biologists. Further investigation into the use of Emigrant Spring Creek by Yellowstone cutthroat trout and rainbow trout would strengthen the management approach to managing these fish in sympatry. Trapping incoming migrants, combined with genetic evaluations of spawners and their progeny, will be a useful complement in managing Emigrant Spring Creek to benefit native species.

5.0 Literature Cited

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