Final Report

Slate River Wetlands Preserve Erosion Control
Crested Butte, Colorado

Submitted to: Colorado Water Conservation Board
December 19, 2012

Submitted by: Crested Butte Land Trust

Slate River Wetlands Preserve Erosion Control Summary 2012

Project Purpose:
The Slate River Wetlands Preserve Erosion Control project seeks to restore a section of river that has experienced significant stream bank erosion.

Project Statistics:
Location: Section 27 lying south of the southerly boundary on Gunnison County Road 734, Township 13 South, Range 86 West of the 6th P.M.
38.8697146 N, 106.98782310000001 W
County: Gunnison
Water Division: 4
Project Length: 632.61 Linear Feet
Adjacent Property Owners: 7
Begin Construction: 11/2/2011
End Construction: 11/23/12
Rock Installed: 200 CY *(3 J hooks, and 9 bank armoring rocks)*
Gravel blending: 280 CY
Project Total $: $29,830 (see page 11 for full budget)

Introduction and Background

Stream bank erosion along the Slate River is an issue that has been studied for over a decade. The Crested Butte Land Trust's Rice parcel, which includes .12 miles of the Slate River, is a particularly vulnerable section. On this parcel, the river takes a drastic bend in between two head gates that are in use for irrigation. In addition, historic grazing has eroded riverbanks and deteriorated riparian flora beyond the point of natural repair.

For several years, the Land Trust invited a variety of experts to the site to research options. A geomorphic assessment of the Upper Slate River Valley, completed by Eco Metrics and Alpine Eco, confirmed the Land Trust's concerns that this site was a high priority for mitigation and restoration. This report indicated potential for the river to avulse into the downstream headgate if restoration efforts were delayed or foregone. The geomorphic assessment also identified the Upper Slate River as prone to high sedimentation and indicated that on and around the Rice property, this sedimentation has been aggravated by human impacts. Specifically historic gravel mining up and downstream of the property (in the 1970s) is thought to be a significant contributing factor to erosion issues.

During this time, the downstream landowners experienced challenges managing the water as it flowed through and around their headgate. On multiple occasions, both upstream and downstream headgate owners armored the structures with unsightly rip rap which compounded some of the erosion problems.

After discussions with the landowners and experts, the Land Trust contracted John Scott, District Conservationist for the USDA Natural Resource Conservation Service, to create an erosion control plan for this section of river. Mr. Scott's plan included the construction of three j-hooks with bank sloping and channel opening, blending a gravel bar in with a point bar on the west side of the river and repairing the

upstream headgate. The Crested Butte Land Trust hopes that this restoration work will promote optimum hydrological and riparian health and protect the two functional head gates in an effort to improve the condition of the Slate River. The long-term success of the project will be measured by the restoration of the riverbanks and the protection of the two headgates.

The Land Trust hired Spallone Construction for all phases of the project. Spallone has done work for the upstream head gate owner for decades. The contractor delivered boulders and heavy machinery to the site and worked over two periods, for a total of five days. The Land Trust Stewardship Coordinator oversaw all construction work and John Scott was hired as a private contractor to help with initial and final construction phases.

All three j-hooks were built off the east riverbank utilizing approximately 50 cubic yards of rock material per structure. The j-hooks reduce high shear stress along the river's bank, and concentrate that energy towards the center of the river. The J-hooks were built into the river approximately 2/3 of the width with a 30 degree upstream angle and a gentle J at their ends. Small boulders were used as "toe" rocks to support and stabilize larger boulders placed on top. The j-hooks sills were built into the riverbank roughly 15 feet although much less of the structures are currently visible. Small scour pools were constructed downstream of the j-hooks by removing gravel which was used as bank sloping fill. The blended gravel bar was moved primarily with a loader and then smoothed out with a backhoe. Approximately 280 cubic yards of gravel material was moved from mid channel and blended into the west bank to restore the natural east bank bend in the river. The gravel was blended into the west bank to match a rough average width and depth of the river in this stretch.

Bank sloping was also completed using heavy machinery. Extra boulders were placed in vulnerable areas along the east bank to help ensure re-vegetation and prevent undercutting. Soil and unconsolidated gravel from the site was combined and used where extra bank fill was necessary.

Finally, a backhoe was used to re-plant six mature willows along the east bank to promote more rapid re-vegetation. These willows were cut back by hand to promote root development over the winter. In addition, roughly 100 willows shoots were hand-planted throughout the east river bank at an estimated bank-full elevation.

The next phase of this project will be accomplished through a partnership with the U.S. Fish and Wildlife service. They have committed to fence and assist with management of the riparian habitat in the spring of 2013.

The Division of Parks and Wildlife Wetland Program Priority Species likely to benefit from the project include Mallard, Cinnamon Teal, Gadwall, Northern Leopard Frog, Common Garter Snake, and others. Specific federal trust species benefitting from the project will include Yellow Warbler, Common Snipe, White-crowned sparrow, Green-tailed Towhee, and others.

Fencing will consist of 4 strand bard wire. To ensure compatibility with wildlife, the top wire will be 42" or lower; the top two wires will be spaced at least 12" apart; the bottom wire will be at least 16" off the ground; and the fence stays will be used every 6'to 8'. To help the fence withstand heavy snow loads a 5 inch diameter treated wood post will be installed for every 100' run of fence and 2 wooded fence stays will be installed between each metal T-post. Fence construction will also include any necessary teardown of old fence.

The Land Trust will agree not to graze the riparian habitat for ten years. Flash grazing will be allowed, with prior written approval from the U.S. Fish and Wildlife Service, during the last 5 years of the agreement.

The exact fence alignment is still being determined by Land Trust staff and the FWS Assistant State Coordinator.

U.S. Fish and Wildlife Service has also committed to assisting with re-vegetation efforts in conjunction with fencing construction in the spring of 2013. Re-vegetation of the eastern riverbank will continue as necessary using both mature willows and willow shoots harvested from the property. Re-vegetation rates will be consistently documented to track progress and determine the need for further planting. The Land Trust will control noxious weeds within the fenced area, for at least ten years, as part of the cost share of the project. Noxious weed control will be done using hand pulling and chemical spraying as necessary.

Results

The anticipated project results include:

- Slowing water flows and directing water away from the damaged bank;
- Correcting the course of the river and helping to reduce the sediment load;
- Protecting the damaged riverbank and restoring it to its natural condition;
- Improvement of water quality;
- Maintaining or improving proper function of head gates; and
- Improving visual values.

Project Design

John Scott, District Conservationist, created the plan as a relatively low impact means of encouraging this section of river to redirect its course. The j-hooks were designed to divert flows away from the east bank and towards the rivers center thus protecting the eroded bank. Gravel blending was designed to restore a natural bend and decrease excessive sedimentation. Bank sloping was included for deposition of natural materials moved for j-hook construction and to allow for re-vegetation. See Appendix A for plan details, drawings and photographs.

Summary

After project design and delivery of materials, the first j-hook was installed. The next step was blending the gravel bar into the west bank. After blending, the middle j-hook was installed and then the upstream j-hook. Finally, banks were re-sloped and re-vegetated was completed both with machinery and by hand.

In addition, several pieces of concrete placed in 2010 to protect the upstream Kapushion headgate were rearranged due to their obstructive positioning. John Scott, who created the erosion control plan, joined the Land Trust Stewardship Coordinator and contractors for the initial project work and at the end to ensure the work was managed according to the plan's original intent.

Future plans for the property include cattle exclusion fencing to maintain the riparian area, noxious weed control and enrollment in the Colorado Water Conservation Board Measureable Results Program.

The Colorado Water Conservation Board Measurable Results Program will assist in monitoring and evaluation of the restoration project. The goals and purpose of this program are to collect high quality reproducible survey data that can be used to track and assess stream condition changes at a particular location within a project site over time and to assess trends and determine if efficiencies are being met. The last week in November, one week after project completion, a private contract surveyor hired by CWCB joined the Land Trust Stewardship Coordinator on the property to establish repeatable cross section surveys. Six cross sections were established, marked and surveyed. Future surveys will be determined by CWCB based on significant river events. In addition, the Land Trust monitors the property every year based on Land Trust standards and these reports will address river course and upland area changes on an annual basis.

Future Projects

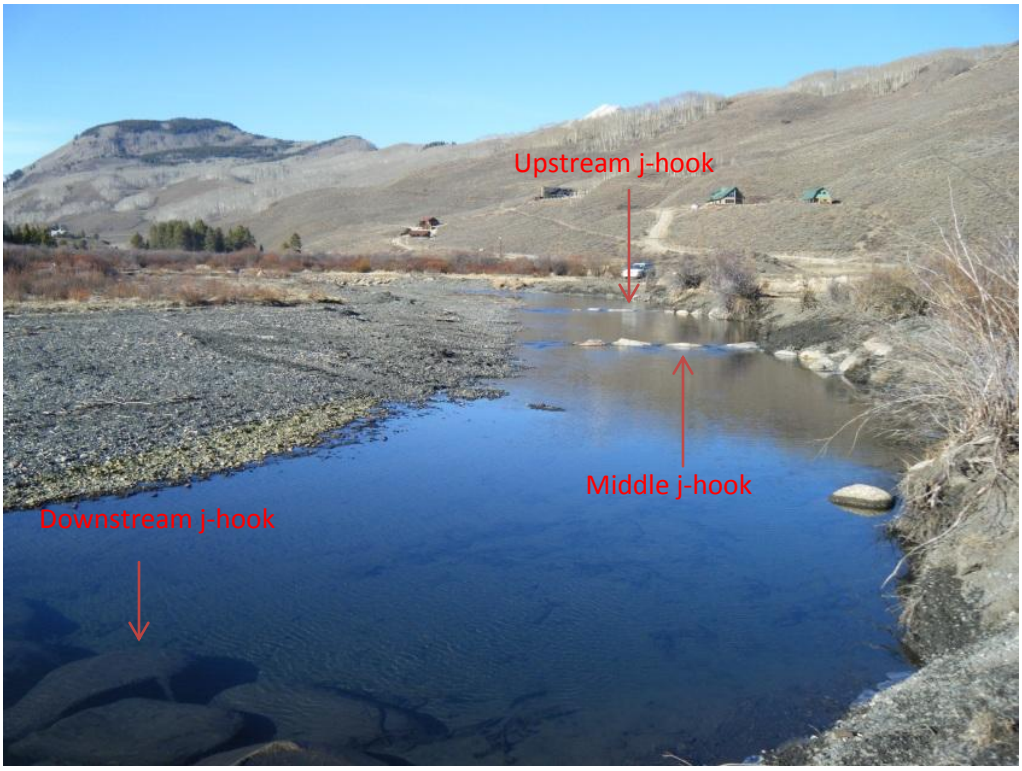
In the spring of 2013, the Land Trust will seek funding to complete a Prediction Level Assessment (PLA) on the Rice parcel and properties downstream. The PLA phase involves making detailed quantitative studies of specific reaches or groups of reaches with the goal of predicting degrees of channel instability, departure from reference condition, and actual sediment volume yields by source and process. PLA studies are specifically designed to inform management decisions and restoration or mitigation designs by quantifying the potential for improvement by different options.

Looking north towards Paradise Divide

Pre-work gravel bar obstructing natural bend

Post work gravel bar blended into west bank

Pre-work view of river stretch (This photo was taken in 2010. The east bank has since eroded to the extent that the pine tree in the forefront was washed downstream)



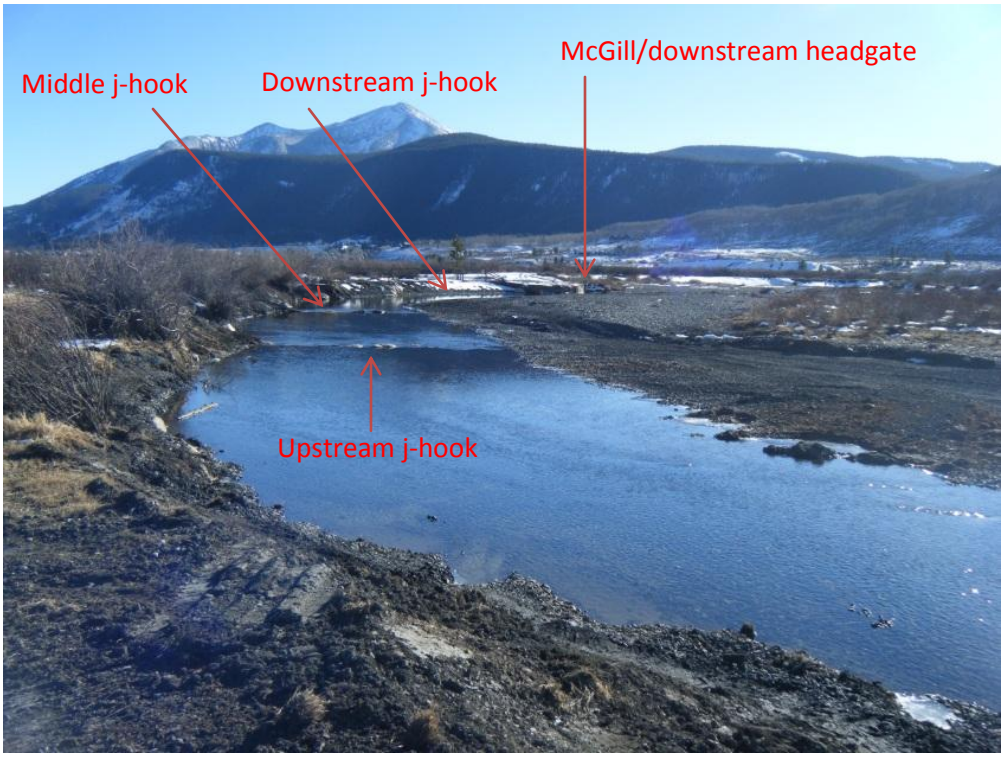
Post work view of downstream, middle and upstream j-hooks

Pre-work view of river stretch at high water

Post work view of middle and upstream j-hooks

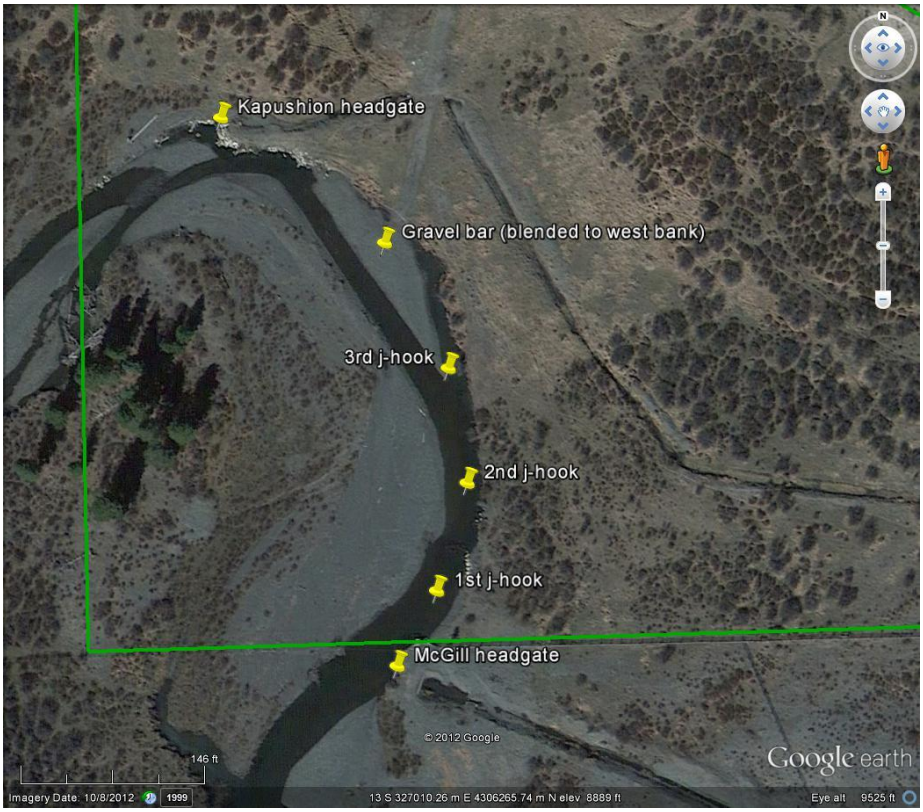
Looking south towards Crested Butte

Pre-work view of river stretch and east bank



Post work view of restored bend and j-hooks

Property overview



Structure placement map

Task	Description	Completion Date	CWCB	CBLT	US F &W	In Kind	Total
1	J-hook construction, gravel bar blending and stabilization	Nov. 2012	$7,611	$4,611	$0	$0	$12,222
2	Construction materials	Nov. 2012	$7,028	$1,000	$0	$0	$8,028
3	Re-vegetation plan and materials	2012-2015	$0	$160	$0	$598	$823
4	Noxious weed control	2013-2015	$0	$1,304	$0	$598	$1,902
5	Cattle exclusion fencing	June 2013	$0	$0	$5,814	$0	$5,814
6	Project design and oversight	2012-2013	$361	$560	$0	$640	$1,041
	TOTALS		**$15,000**	**$7,635**	**$5,814**	**$1,836**	**$29,830**

Appendix A

Crested Butte Land Trust
Rice Parcel – Streambank Protection Project

John Scott – NRCS

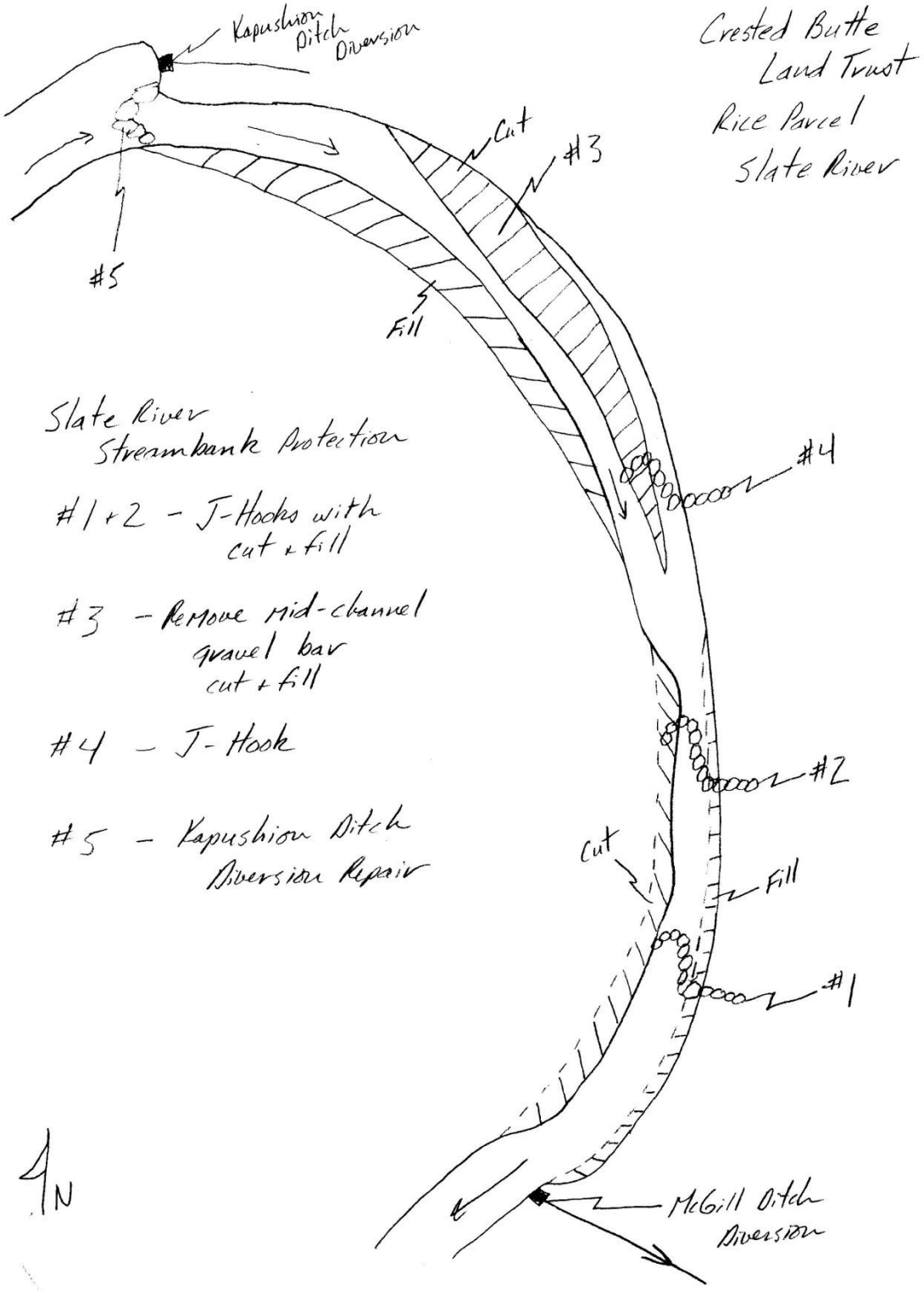
The following is from a field visit with Danielle Beamer, Stewardship Coordinator to look at the site. We staked J-hooks #1 and #2, and then took a GPS point at #4.

The J-hooks will be about 30 CY's per structure with about 100 CY's of cut from the gravel bar and fill associated with #1 and #2 J-hooks to provide for bank sloping and opening up the channel to keep the channel out from the bank.

#4 J-hook would be completed only if the Land Trust had money in their budget to remove the mid-channel gravel bar. This gravel bar (#3) could be blended in with the point bar on the west side of the Slate River and would amount to about 280 CY's of material moved and repositioned to keep the River against the bank.

#5 is some repair work that could be completed on the Kapushion Ditch Diversion. This would need to be coordinated with the Kapushion's . I have talked with their land manager, Barb East, and she is aware of the need to do some work at this location.

The mid-channel gravel bar was something that was not expected when we visited the site. The Slate River is one that has lots of bed load and is always trying to move. This project is probably a short term solution to providing some streambank stabilization because we are only addressing that small section of river on the Rice Parcel.


Kapushion Ditch Diversion
Crested Butte Land Trust
Rice Parcel
Slate River
Cut
#3
#5
Fill
Slate River
Streambank Protection
#1+2 - J-Hooks with cut + fill
#3 - Remove mid-channel gravel bar cut + fill
#4 - J-Hook
#5 - Kapushion Ditch Diversion Repair
#4
#2
Cut
Fill
#1
N
McGill Ditch Diversion

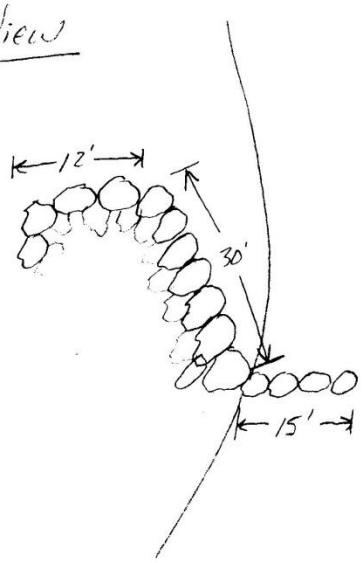
Crested Butte Land Trust

Rice Parcel

Slate River

J-Hooks

Top View

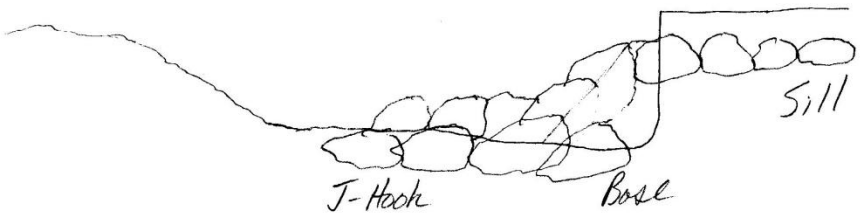


≅ 30 CY's of rock per structure

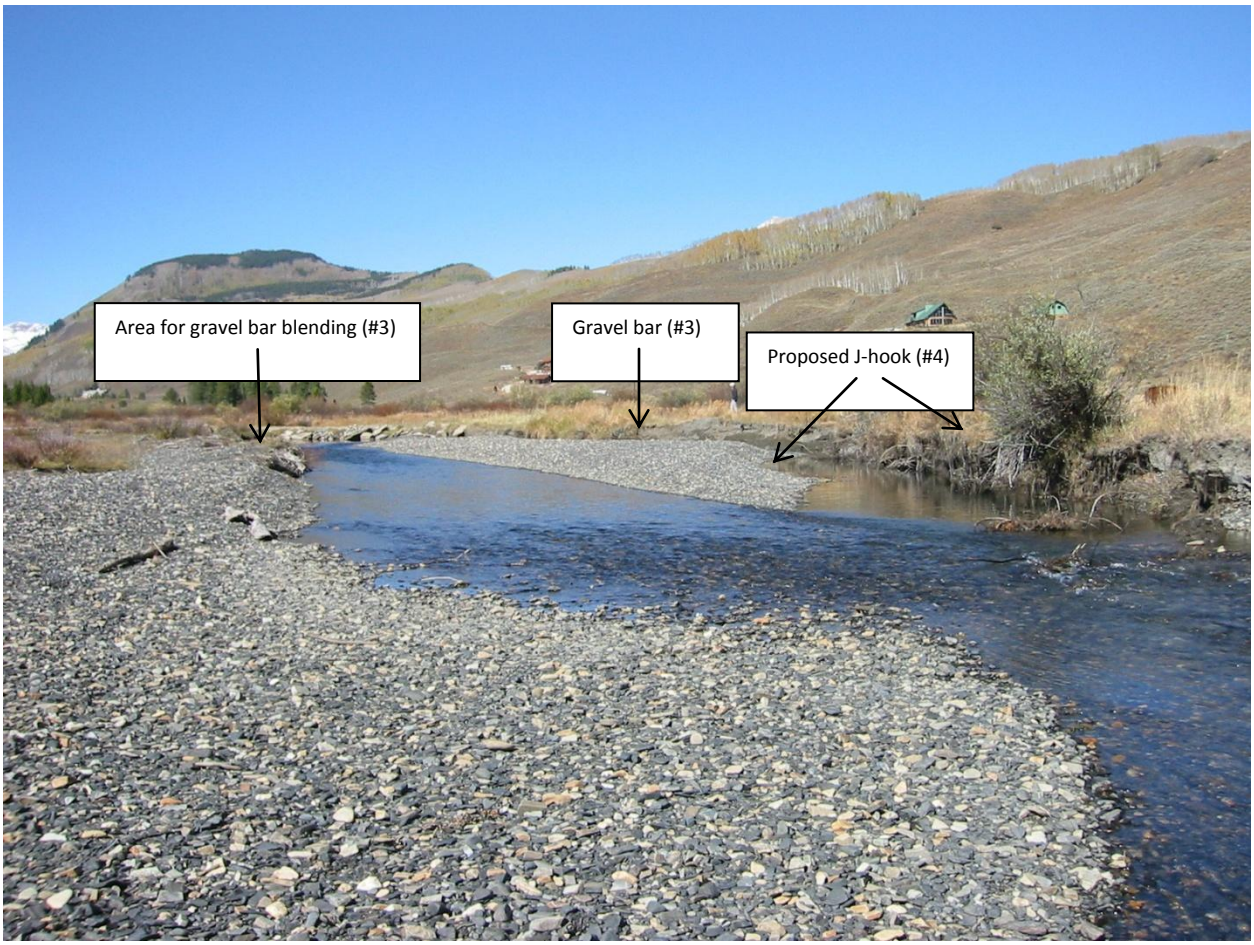
3' minimum average diameter (bigger is better)

≅ 100 CY's of cut from gravel bar used to provide fill for bank sloping.

Cross-section



Location for J-hooks #1 and #2- looking downstream (south)



Mid-channel gravel bar- looking upstream (north)