

Final Report
Spanish and Silver Creek Restoration
Projects
Funded by Plumas Watershed Forum



Plumas Corporation
September 2009

Background

The FR-CRM was approached by two landowners, Larry and Glory Kellett on Spanish Creek, and Bob Burney on Silver Creek, to address erosion concerns on their properties in 2005. In both areas, channel incision and constriction were causing bank erosion, channel widening and loss of property. Identified problems were excessive bedload deposition on the Kellett property and lack of sediment capture on the Burney property. The FR-CRM agreed to work with both landowners to treat the problems. Surveying, design, environmental work, project construction, and monitoring was funded by the Plumas Watershed Forum in 2006, which awarded \$147,000 for the Spanish Creek project and \$51,000 for the Silver Creek project under Agreement #06-304.

The stated goal of both projects was to restore the primary functional attributes of the stream channel and floodplain systems and to either capture and store bedload sediment or facilitate its transport.

Watershed conditions range from excellent for the Silver Creek watershed to poor in the Spanish Creek watershed, due primarily to historic mining that used hydraulic methods to wash material into streams. This material makes up most of the large amount of gravel still in transport by Spanish Creek to this day.

The Spanish Creek project area is within a larger area affected by the deposition of hydraulic mine outwash material into which Spanish Creek has downcut to its present level, abandoning the natural floodplain, Spanish Ranch meadow, and its historic, mine outwash floodplain. Within the project area, the stream has widened sufficiently, approximately 600 feet, to allow the development of a floodplain at the current stream elevation.

Two causal agents are at play within the Spanish Creek project area. The first is the large over supply of bedload that enters the area. The stream channel transports some of it to downstream reaches, some deposits within the project area to be transported downstream at later dates and some remains in the project area, causing channel aggradation and the stream to migrate.

The second causal agent, the one responsible for the greatest impact to the project area, is the very narrow bridge at the downstream end of the project area, a mere 43 feet wide. Upstream of the crossing, the active stream channel is 47 – 50 feet wide, with an additional 550 feet of floodplain width. Because the bridge crossing is so narrow, high flows cannot move through the constriction as fast as it enters the project area and water backs up, slowing flows upstream of the crossing, with a commensurate drop in the amount of bedload moving through the reach. The result is a filling of the channelway with bedload material and an acceleration of stream channel migration. The braided stream system was primarily moving in an exaggerated meander bend towards the Kellett's house, and also threatened to run around the bridge over the crossing's south approach.

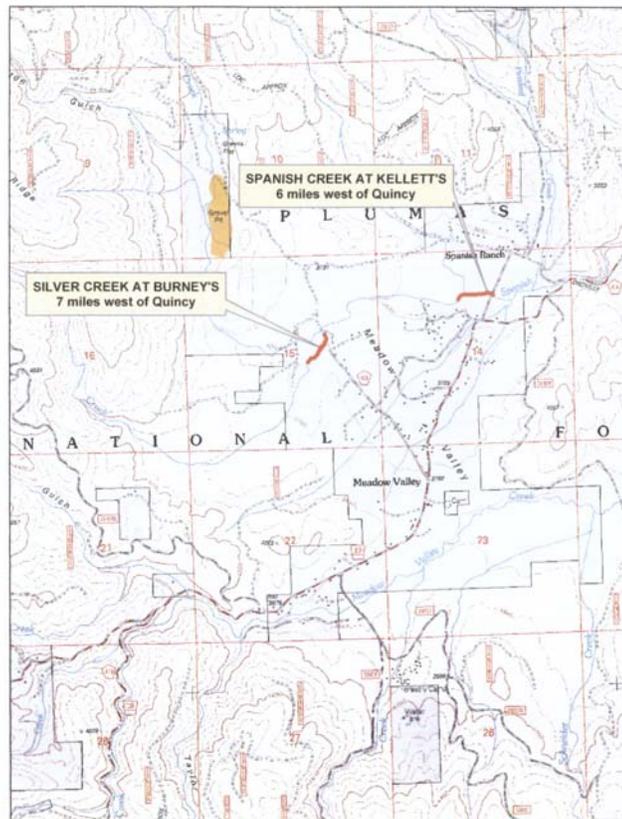
The Silver Creek project area is completely on private land originally homesteaded, and currently owned by the Burney family. The property was naturally the interface area between the upstream transport channel reach, and the downstream response reach (meadow floodplain). It is the area where most of the bedload material would have naturally deposited. Degradation of downstream reaches has affected the Silver Creek response reach, lowering its base level and degrading the channel. The Silver Creek response channel is now within an

actively eroding trench that extends from the mouth to the upstream transport channel reach. Much of the bedload material delivered to the property is further transported downstream to Spanish Creek, where unstable channel conditions are the norm.

The Spanish Creek project is located in Meadow Valley immediately upstream and including the crossing of County Road 413 at Spanish Ranch, in the north half of Section 14, T24N, R8E. The project reach is approximately 2300 feet long, including the road crossing. Access is via Bucks Lake Road (County Road 414) to the Spanish Ranch and Pineleaf turnoff in Meadow Valley, approximately 6 miles west of the town of Quincy. The Silver Creek project is located in T.24N. R.8E. Section 15, just upstream from its confluence with Spanish Creek. The project reach is nearly 1700 feet long. Access is via Bucks Lake Road (County Road 414) to Silver Creek Road in Meadow Valley, approximately 7 miles west of the town of Quincy.

Figure 1. Project Locations

MEADOW VALLEY STREAM CHANNEL REHABILITATION PROJECT LOCATIONS



Project Descriptions

The goals and objectives of the Spanish Creek project are to:

1. Reduce the deposition of sediment and the aggradation of the channel within the project reach.
2. Reduce or eliminate property losses.

3. Reduce the risk of high flow damages to the county road crossing by improving flows through the crossing.
4. Improve water quality on-site and downstream.

The following actions were implemented to meet the project goals and objectives:

1. Approximately 200 feet of rapidly eroding stream bank was reconstructed to a configuration that evenly distributed the stress of turning water flows.
2. Four large boulder vanes were built at floodplain elevation along the reconstructed bank to keep the center of highest flow (thalweg) away from the bank. The upper bank was vegetated with transplanted material from on-site and seedlings from the community greenhouse at Feather River College.
3. Four large gravel berms, each approximately 1200 cubic yards, were removed from the active floodplain.

The south approach to the County's bridge was going to be reconstructed, adding 10 to 15 culverts at floodplain elevation; however, this work was postponed to coordinate with the County's bridge replacement schedule. The Plumas County Department of Public Works has ranked the bridge high priority for replacement in the near future (3-5 years). The installation of floodplain culverts will be included in the bridge replacement project.

The goals and objectives of the Silver Creek project were to:

1. Reduce the transport of bedload material downstream by capturing it within the project reach.
2. Reduce or eliminate loss of property by reducing or eliminating bank erosion.
3. Improve conditions of water flow by reconnecting the stream channel with its floodplain.
4. Improve water quality on-site and downstream.
5. Induce aggradation within the entrenchment so that the upper floodplain (terrace) is eventually accessed by frequent high flows and deposition of coarse bedload material is restored to its natural location, the most upstream section of the project reach.

The following actions were implemented to meet the project goals and objectives:

1. One whole tree jam was constructed within the entrenchment between the boundary with the National Forest and the railcar bridge.
2. A set of rock vanes was constructed along the outcurve bank immediately upstream of the bridge.
3. The whole tree jam located 250 feet downstream from the bridge was improved.
4. The property is being managed into perpetuity to allow large trees to grow, die and eventually fall into the channel, providing a source of large wood recruitment.
5. The 90° bend near the downstream end of the project reach was stabilized with boulder vanes and vegetation transplants.
6. All vertical banks were laid back and vegetated with on-site transplants and native grass seed to provide a measure of protection during periods of high flow overbank and reentry into the channelway, especially along the downstream project reach.
7. Riparian vegetation species were planted on sparsely vegetated floodplain areas.
8. A series of rock-riffles along the lower 500 feet of the project reach were constructed to allow the frequent high flows (greater than bankfull) to access the inset floodplain that has developed there. The lower 2 to 3 structures act as grade-drop structures, lowering flows back down to the existing gully elevation before leaving the property.

Periodic enhancement of the whole tree jams may be necessary in the future to maintain the natural depositional component of this channel reach.

Project construction began on July 21, 2008 and was completed on August 11, 2008. Out of five bidders, the construction contract was awarded to Genesis Systems of Sloat, CA for \$49,780. Final construction costs for both projects combined were under budget by \$102,559 due to not installing the culverts on Spanish Creek and receiving lower than current market rate bids on construction. Total project costs on each project are outlined below:

Spanish Creek:	Total Budget	Total Expenditures
NEPA/CEQA	\$13,000	\$12,582.75
Permit Acquisition	\$2,000	\$ 1,600.00
Project Design/Eng	\$2,000	\$ 1,987.64
Contract Prep	\$900	\$ 900.00
Contract Admin	\$5,000	\$ 5,000.00
Construction	\$123,000	\$32,542.83
Materials/Supplies	\$100	\$ 100.00
Monitoring	\$1,000	\$ 1,000.00
TOTAL	\$147,000	\$61,125.30

Silver Creek:	Total Budget	Total Expenditures
NEPA/CEQA	\$13,000	\$ 8,517.49
Permit Acquisition	\$2,000	\$ 1,250.00
Project Design/Eng.	\$2,000	\$ 2,000.00
Contract Prep	\$900	\$ 482.18
Contract Admin	\$2,000	\$ 2,000.00
Construction	\$30,000	\$17,897.49
Materials/Supplies	\$100	\$ 54.89
Monitoring	\$1,000	\$ 1,000.00
TOTAL	\$51,000	\$33,247.16

Total expenditures on Agreement 06-304 were \$94,372.46, with a remaining balance of 103,627.54, which was returned to the Forum for allocation to other projects in February 2009.

Did the project meet the goals of the Monterey Settlement?

1) **Improve retention of water for augmented base flow in streams:** The goals and objectives of these projects were not to improve retention of water for augmented base flows. These project areas were not conducive to restoring the channel back to its historical floodplain. All work was conducted within the entrenched channels with their developed floodplain at current stream elevations.

2) **Improve water quality and streambank protection:** Water quality data was not collected; however, some cross-sectional data on bedload was gathered for project design of the woody debris jams on Silver Creek. Sedimentation sources within the project reaches were reduced through laying back eroding banks and planting both the banks and their associated floodplains with native plants from on-site and the local community greenhouse. Constructed boulder vanes will keep water flows to the center of the channel away from the banks reducing sediment and bank erosion, and log debris jams will trap sediment and bedload within the project reach and

improve water quality downstream. In addition, the removal of gravel bars in Spanish Creek will allow better stream flow through the project area, allowing for a more even distribution of the bedload deposition and reduce bank erosion from channel migration. The following photo sets illustrate the implemented streambank protection and bedload capture techniques employed in each project.



Spanish Creek on Kellett property pre-project eroding bank May 2004.



Spanish Creek, post- construction August 1, 2008, showing reconstructed bank with boulder vanes and transplanted vegetation.



Silver Creek pre-project June 2, 2005 showing vertical eroding bank.

Silver Creek post-project May 23, 2009. Bank is laid back and terraced, with boulder vanes in channel directing flows away from the outcurve bank. Vegetation was planted/seeded on the terraced floodplain.



Pre- (6/2/05) project woody debris jam on Silver Creek; enhanced debris jam post- (5/23/09) project.

Note: Whole trees are used and restricted from floating by crossing over the mass with the largest trees held in place by placing their ends on the upper banks and counter-weighting with large boulders. Each jam was also filled with sand, gravel, and cobble material from adjacent bars.

3) **Improve upland vegetation management:** Upland vegetation management is not a concern within the Spanish or Silver Creek project areas. Grazing does not occur on either property, and upland areas surrounding the project reaches are well vegetated with trees, shrubs, and grasses. The Silver Creek property is being managed into perpetuity to allow large trees to grow, die and eventually fall into the channel, providing a source of large wood recruitment.

4) **Improve groundwater retention in major aquifers:** Meadow Valley is not a major aquifer in the Feather River Watershed; nor was groundwater retention an objective of project implementation.

5) **Lessons learned**

It has been challenging in coordinating with the Plumas County Public Works Department to install the floodplain culverts at the Spanish Ranch Road bridge crossing. It wasn't until after we had received funding to install the culverts that we were informed that the bridge was a high priority for replacement. Understanding there are fiscal restraints we have learned that just because something is prioritized doesn't mean it will be completed in a timely manner. Our hope is that the bridge replacement will occur in the next five years, as planned, to aid in the overall rehabilitation of Spanish Creek both above and below the bridge, as we move forward with implementing the Spanish Creek Watershed Rehabilitation Strategy.

Continued Monitoring

Revegetation success and noxious weeds should continue to be monitored for the next two years. Project areas were surveyed for noxious weeds in July 2009. Four bull thistle were found and hand removed in the Silver Creek project area and no noxious weeds were found in the Spanish Creek project area. Vegetation planting survival is 60% (on-site transplants, willow staking, seedling transplants, and seeding). Ensuring the treated banks become heavily vegetated will assist in reducing erosion potential during high flow events and decrease sedimentation rates.

During implementation of the Spanish Creek project, mitigations for protection of yellow-legged frogs required we survey for frogs prior to and during equipment operation. Any frogs that were seen were captured and moved to a safe location above and below the project reach. In 2009, we re-surveyed the project reach to see if the frogs had re-located back into the project area. Four adult frogs were found in the project reach (3 occurring in the pools around the boulder vanes) and hundreds of tadpoles were found in the main channel of Spanish Creek, immediately upstream of the project reach.



Yellow-legged frog found under boulder vane on Spanish Creek, August 20, 2009.



Habitat along boulder vanes where yellow-legged frog was detected on August 20, 2009.