# Kerber Creek Watershed Restoration Project

## Squirrel Creek Restoration - 2009

### Project Scope

The Bureau of Land Management (BLM) and Forest Service (FS) partner with two local non-profit groups, Saguache County Sustainable Environment and Economic Development (ScSEED), Southwest Conservation Corps (SCC), Trout Unlimited (TU), and AmeriCorp Volunteer In Service To America (VISTA) on Kerber Creek watershed restoration efforts. The project purpose was to stabilize steep slopes adjacent to Squirrel Creek. Squirrel Creek, a tributary to Kerber Creek is located in the up stream area of the watershed. Squirrel Creek is the site location of the 2009 Colorado Watershed Conservation Board (CWCB) Project Grant that was funded. BLM , FS, and other groups have been working on Kerber Creek watershed restoration efforts since 1993. The Squirrel Creek slope stabilization project is a small but important measure necessary to improve overall watershed conditions.

The FS provided $9000 cash match for the project which went entirely towards the purchase of erosion protection materials. BLM, TU, and the VISTA volunteers provided logistical and ground support as well as project oversight.

ScSEED is composed of citizen volunteers from throughout Saguache County, Colorado and the San Luis Valley. Their purpose is "To work together as a community to develop a sustainable economy that builds on our existing strength, contributes to a strong integrated community, and protects the environment, rural lifestyle and the character of Saguache County." ScSEED is the fiscal agent for this grant.

The SCC, founded as a non-profit agency in 1998, provides young women and men with structured, safe and challenging work and educational opportunities through employment projects that promote personal growth, the development of social skills, and an ethic of natural resource stewardship. The SCC program model, built upon the legacy of the Civilian Conservation Corps of the 1930s, incorporates guiding principles of experiential learning, respect, openness and willingness, commitment, responsibility, pride, excellence, health and safety, and fun. SCC under contract with ScSEED, performed most of the physical labor of placing the erosion features on the ground.

### Past Land Use / Site History

In 1880, silver and gold veins were discovered in the Kerber Creek watershed. This quickly developed into a mining boom and several small towns were formed including Bonanza, Kerber City, Sedgwick, Exchequerville, and Parkville. Bonanza had a series of booms and busts, the final and largest of which came in the 1920s with the reopening of the Cocomongo, Bonanza,

and Rawley Mines. The bulk of that work finished in the 1930s, with a fire nearly decimating Bonanza in 1937. Since the 1930s, large scale mining has not returned to the area.

As a by product of past mining, legacy mine tailings remain. As early as the mid 1880s, there are records of ranchers downstream becoming adversely affected by the mining operations. Not only could they see the water quality in Kerber creek declining, but mine tailings were being deposited downstream by storm events, natural run off, and breaching or failing tailing dams. Today there are over 60 acres of tailings deposited up to 19 miles downstream of the large mining sites. The deposited tailings have reduced soil pH levels, and increased metal solubility and mobility resulting in poor water quality and poor soil growth conditions.

In 1998, American Smelting and Refining Company (ASARCO, Inc.) completed their riparian restoration effort along the main stem of Kerber Creek on private, BLM, and FS public lands. At the same time, Colorado Department of Public Health and Environment (CDPHE) performed a second removal action at three waste piles located within the watershed. Because of this, Kerber Creek has already progressed from supporting virtually no aquatic life over a 19-mile long stretch to nearing water quality goals. Currently, significant Colorado Voluntary Cleanup and Redevelopment Act (VCUP) efforts are underway taking measures to complete the Kerber Creek watershed restoration efforts. Stream restoration work has included re-establishment of riparian vegetation adjacent to surface waters, enhancement of natural meandering channel patterns, channel stabilization with rock barbs, vortex weirs, root wads, and willow/alder plantings, and installing erosional features to reduce workings. This effort is funded through a 2008 Clean Water Act (CWA) Section 319 grant.

Although the general tailings removal action objectives were met in this earlier work, some tailings are still present and degraded stream channel conditions continue to persist over a distance of 19 miles. Along several stretches of the stream, water quality chemistry for cadmium, silver, lead, copper, zinc, and pH do not meet water quality standards, which has likely affected beneficial uses downstream. Low pH and high metal concentrations prevent re-vegetation and stream bank stabilization. Stream banks are not aggrading with clean soils, and the stream channel is not capable of sustaining flows during low precipitation periods or promoting protective vegetative recruitment and establishment. Conversely, high flows can scour a stream bank, which adversely affects the natural colonization of riparian plant species.

Although the ASARCO voluntary cleanup action has been completed at Squirrel Creek, some tailings remain in place and the degraded stream channel conditions still exist in that watershed.

One major contributing factor to stream degradation is the un-vegetated slopes adjacent to the streams (see Squirrel Creek in the photo below). Along Squirrel Creek, the hillsides downstream of the Rawley 12 mine are extremely steep (% 60-70 slopes). The hillsides are void of vegetation and are contributing sediment and excessive flows to the stream channel. This project

is expected to help restoration efforts by rebuilding the A horizon with captured upslope sediment and organic material.

**Project Goals**

This project is part of a larger restoration project extending approximately 19 miles downstream. As part of the larger project, water quality and environmental goals have been established and are presented below.  Environmental date collection tasks also presented below.

**Table 1: Water Quality / Environmental Goals**

| **Water Quality/ Environmental Goals** | **Objective** | **Environmental Data Collection / Tasks** | **Frequency** | **Measurable Results** |
|---|---|---|---|---|
| Reduce metal mobility in soil | Reduce metal concentrations in Kerber Creek | Using CDPHE water quality data and monitoring sites already established (TMDL, 2008). | Prior to project initiation (2008) and then again in 2011 and 2015 | Within 5 period, meet site-specific chronic water quality standards for zinc, cadmium, and copper in Segment 9b) |
| Increased sinuosity | Improve floodplain recharge, and reduce shear stress | Using past, current, and future satellite imagery, measure stream length and divide by valley length(Rosgen 1996)<br>Measure on the ground, in three 250 meter long reaches. | Prior to project initiation (2008) and then again in 2011, and 2015[1] | 2-5% Increased sinuosity in a 1 mile reach |
| Reduced channel width | Stabilize banks and facilitate sustainable fate and transport of sediment | Install three semi-permanent cross sections and measure width to depth ratios from floodplain to floodplain (Rosgen 1996). | Prior to project initiation (2008) and then again in 2011 and 2015 | Reduce channel width 10% |
| Improved depth | Increase depth of stream for habitat improvement and floodplain | Install three semi-permanent cross sections and measure width to depth ratios from floodplain to | Prior to project initiation (2008) and then again in | Increase depth 10% |

| Water Quality/ Environmental Goals | Objective | Environmental Data Collection / Tasks | Frequency | Measurable Results |
|---|---|---|---|---|
| | recharge | floodplain (Rosgen 1996). | 2011 and 2015 | |
| Increased macro-Invertebrate density | Improve macro-invertebrate density to assimilate nearest similar potential natural community stream | Sample and analyze macro-invertebrates at 3 sites focusing on EPT ratios. Samples will be collected at a minimum of three sites in the Kerber Creek watershed and 3 sites in Sheep Creek watershed. (Utah St. Bug Lab protocols) | Prior to project initiation (2008) and then again in 2011 and 2015 | Upward trend in EPT macro invertebrate density |
| Increased fishery density | Improve fisheries | Partner with CDOW and FWS to shock and determine fishery density at 3 sites (DOW Jake-o-matic) | Prior to project initiation (2008) and then again in 2011 and 2015 | Overall increase in fish density and biomass |
| Increased upland vegetation cover | Decrease overland flow, reduce metals loading, and slow infiltration of rainfall and snowmelt | Install 3 semi-permanent Daubenmire transects and record vegetation frequency and cover (Daubenmire 1967) | Prior to project initiation (2008) and then again in 2011 and 2015 | Increase vegetation cover 50% |
| Stabilize stream banks | Improve stream bank stability until it has the ability to withstand event flows without extensive | In three 100 meter reaches measure unvegetated stream bank reaches on both banks (USFS 1996, Daubenmire 1967) | Prior to project initiation (2008) and then again in 2011 and | Increase stream bank vegetation cover 50% |

| Water Quality/ Environmental Goals | Objective | Environmental Data Collection / Tasks | Frequency | Measurable Results |
|---|---|---|---|---|
| | erosion | | 2015 | |
| Display change | Demonstrate change over time with photography | Establish at least 3 semi permanent photo points (BLM TR 1734-4, 1999) | Prior to project and then again in 2011 and 2015 | Monitor long-term trends in riparian and upland habitats |

At the time of the CWCB grant award, no monitoring sites were planned in the Squirrel Creek watershed. The one time cost for monitoring the parameters listed above is approximately $15,000 for every monitoring event. Because the overall project was approached on a watershed scale, sampling sites were established that would depict change in three distinctly different habitats and stream reaches. Those sites are depicted in the figures 2 and 3 below.

The Kerber Creek Restoration Project partners understand the necessity for documenting project success and will be submitting a small proposal to CWCB in the near future for the purpose of establishing cross sections on Squirrel Creek and collecting photo documentation data over time. Depending on the funding received a number of semi-permanent cross sections will be established along Squirrel Creek from below the Rawley 12 adit to the confluence of Kerber Creek. The collected data will be compared against subsequent sampling events for the purpose of documenting increased sinuosity, reduced channel width, and improved stream depth.

**Figure 2: Water Quality, Fishery, and Macro Invertebrate Sampling Sites**

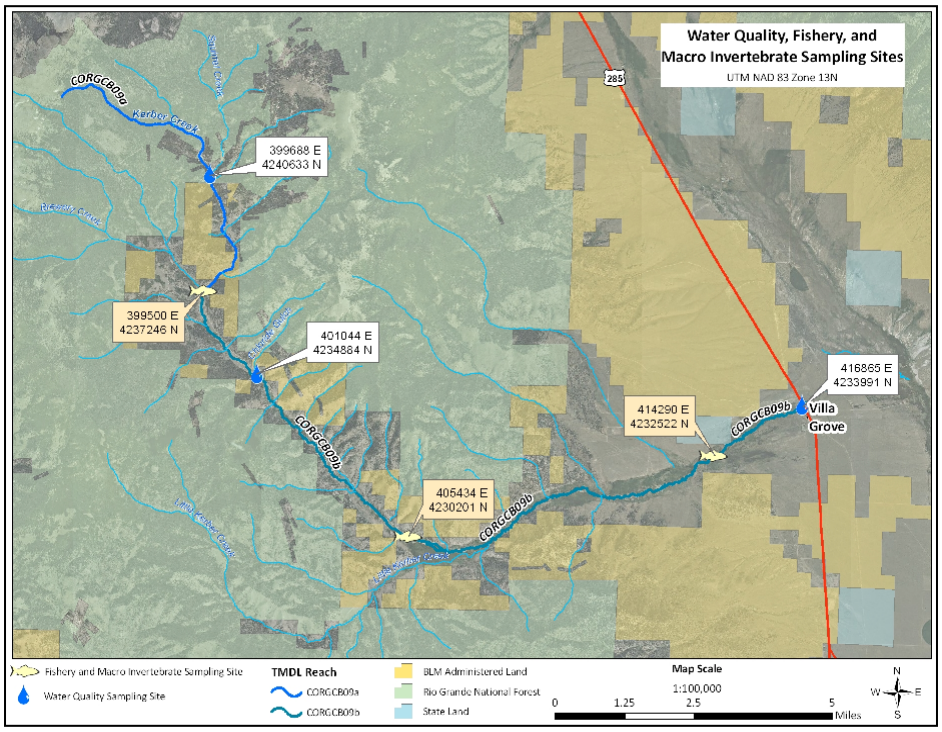
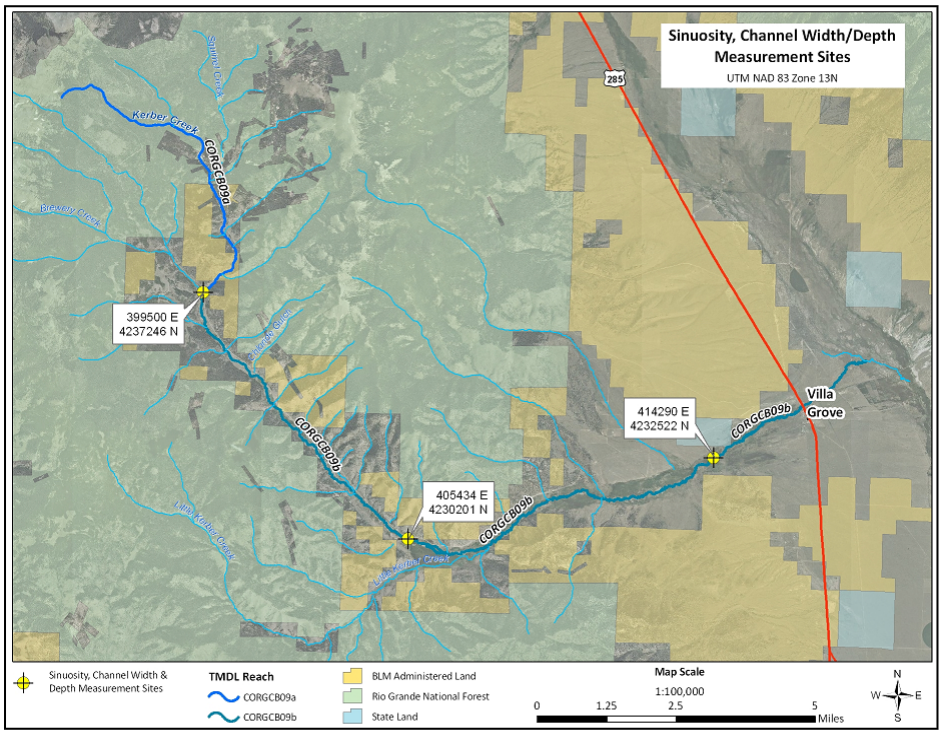



**Figure 3: Sinuosity, Channel Width/Depth Measurement Sites**



**Work Accomplished**

Work completed with the 2009 Colorado Watershed Restoration Program (CWRP) Project Grant included stabilization of over 10.5 acres. Work included installation of 5700 feet of wattles, and 300,000 feet$^2$ of erosion blankets on approximately eight acres. See the photo below.

Wattles were installed with 2' wooden stakes that were pounded into the ground until they hit refusal or only 6" of the stake remained out of ground. Stakes were spaced in two foot intervals. Wattles were place in concave fashion to optimize the potential for collection of upslope soil and organic material. Wattles were staggered as per the manufacture guidance to allow proper passage of water and snow.

Prior to placement of the blankets, seeds were broadcast on the ground surface. A native seed mix for the Kerber Creek watershed was utilized to optimize growth. The erosion blankets were secured with 6" metal stakes at 2' intervals. Erosion Blankets were place on flat surfaces and also on the steep rocky hillside on the west end of the site. The erosion blankets placed on flat surfaces should provide wind sheer and moisture protection for seedlings. Those on the steep

west slope are expected to help encourage shrub and tree recruitment plus reduce runoff and sediment to the immediate stream banks.

It is anticipated that both erosion control structures should promote healthy floodplain and riparian development along Squirrel Creek.