

**CLEAN WATER ACT  
SECTION 319 NONPOINT SOURCE POLLUTION PROGRAM DEMONSTRATION  
PROJECT  
FINAL REPORT**

**SOLDIER CREEK 319 DEMONSTRATION  
UTAH COUNTY, UTAH**

**By  
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and  
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Conservation Planner**

**Utah Association of Conservation Districts**

**Utah Association of Conservation Districts  
302 East 1860 South  
Provo, Utah 84606**

**September 30, 2009**

This project was conducted in cooperation with the State of Utah and the United States Environmental Protection Agency, Region VIII.

State (UDAF) Contracts # 05-1644  
Grant # C9998187-03

## EXECUTIVE SUMMARY

PROJECT TITLE: Soldier Creek Watershed Project

PROJECT START DATE: May 19, 2003      PROJECT COMPLETION DATE: September 30, 2007

FUNDING:	<b>TOTAL EPA GRANT</b>	<b>\$132,000</b>
	TOTAL EXPENDITURE OF EPA FUNDS (see cost breakdown on page 5)	\$42,000
	BUDGET REVISIONS*	\$90,000
	TOTAL SECTION 319 MATCH ACCRUED**	\$28,000
	<b>TOTAL EXPENDITURES</b>	<b>\$70,000</b>

\* This grant was amended by reducing the total 319 amount of contract by \$90,000. The money was transferred to another 319 project on the Upper Sevier River.

\*\*The match for this project came from two sources. Utah Department of Transportation (UDOT) did the planning for this project that was within the Highway 6 right-of-way. They also provided the equipment and materials to install the project within their right-of-way. The landowner of this property was the Utah Division of Wildlife. They reviewed the plan and provided assistance as needed, and also the seed used to establish native vegetation. A letter from DWR regarding the project is attached.

### SUMMARY ACCOMPLISHMENTS:

This project converted a badly eroded gully that discharged sediment into Soldier Creek into a functioning sediment retention structure removing 1,000 tons of sediment on an annual basis. Practices that were installed included earthwork to reshape vertical banks to a 2:1 slope, rock installation to trap sediment and protect the gully from further erosion, rock work to reduce velocity of water, an erosion control blanket, reseeding of native vegetation for erosion control, and transplanting willows. The rock work will also protect the end of the culvert so that erosion does not undercut the culvert.

## 1.0 INTRODUCTION

Spanish Fork Canyon has a long history of problems relating to soils and hydrology. Soldier Creek flows west through Spanish Fork Canyon, sharing the narrow valley floor with Highway 6 and the tracks of the Union Pacific Railroad and Utah Railway Company. Solider Creek, a tributary to the Spanish Fork River, is listed on the State of Utah's 303(d) list of impaired water bodies. It is identified as a water body of concern due to excessive sediment and phosphorous. Soldier Creek is classified by the Utah Division of Water Quality and protected for the following designated uses: recreation (Class 2B), cold water fishery (Class 3A), and agriculture (Class 4). Soldier Creek is located within HUC 16020202.

Spanish Fork River and its tributaries flow into Utah Lake, which has also been identified by the State as an impaired water body. The lake has been listed on the 303(d) list due to water quality concerns associated with excess sediment and nutrients. Utah Lake water quality is directly affected by the quality of the waters that drain into it, including the Spanish Fork River, Soldier Creek and its other tributaries. The beneficial uses of the lake are recreation (Class 2B), warm water fisheries (Class 3B), protected waterfowl (Class 3D), and agriculture (Class 4).

By far the largest source of sediment is upland soil erosion. Largely due to inadequate soil cover, the sub-watershed uplands contribute 142,300 tons of sediment to Soldier Creek and its tributaries annually. Roads are another source of upland soil loss. The 568 miles of road within the sub-watershed contribute 40,000 tons of sediment each year. These estimates are derived from the soil surveys and an Interagency Pacific Southwest Inter-Agency Committee (PSIAC, 1968) inventory completed in 2001. The soil survey for that area indicates that highly erosive soils are common because of the persistent occurrence of the Green River Formation that makes plant establishment difficult. As a result, these soils tend to be sparsely vegetated.

One significant source of streambank instability can be attributed to culverts installed to divert runoff away from the railroad tracks and Highway 6. Several of these culverts concentrate storm run-off, creating a highly erosive stream of water that erode new channels across the uplands until it reaches Soldier Creek.

Too much sediment and phosphorus in Soldier Creek negatively affects the designated beneficial uses. The Soldier Creek TMDL stated that Total Suspended Solid (TSS) loads are 46,485 tons per year, and that a TSS load reduction of 5,927 tons per year was necessary. The Soldier Creek Coordinated Resource Management Plan (CRMP) recommended a series of specific actions and management strategies to improve natural resource conditions in Thistle Creek. The TMDL also made recommendations

that included the reduction of sediment coming from the uplands by 5,000 tons per year.

A demonstration project was implemented on Soldier Creek to coordinate with the Utah Department of Transportation to modify an existing gully that is the recipient of channeled water coming off uplands adjacent to Highway 6 in Spanish Fork Canyon.

The Spanish Fork watershed committee prepared the CRMP, and implemented this project. The watershed committee members included the local Conservation District that chaired the committee, local landowners, NRCS, Utah Division of Water Quality, Bureau of Reclamation, Mountainland Association of Governments, US Forest Service, Central Utah Water Conservancy District, Strawberry Water Users Association, Spanish Fork City, Spanish Fork River Commissioner, Utah Department of Transportation, Utah Division of Wildlife Resources, Spanish Fork Grazing Association, Utah State University Cooperative Extension, and Utah County Government.

## 2.0 PROJECT GOALS, OBJECTIVES, AND ACTIVITIES

The project goal is to implement BMPs that will achieve water quality standards to meet the criteria set for the designated beneficial uses for Soldier Creek and Spanish Fork River. The intent of the goal is to reduce sediment delivery to the streams, and provide education to the public.

An additional goal is to develop a design that can be used on other culvert projects along US Highway 6.

### **UDOT gully reclamation project:**

A meeting was held with the Utah Department of Transportation (Highway 6 right-of-way), Utah Division of Wildlife Resources (landowners), and Conservation District staff to review the scope of the project. The project site was visited and UDOT agreed to restore the gully located within their right-of way. Their principle concern was safety to people driving on the highway. Wildlife Resources agreed to allow access to their land and to allow the project to be implemented.

Conservation District staff used a consulting engineer to prepare the hydrologic calculations and design the project to be implemented. The design drawings included a grading plan, typical cross sections, plan and profile sheets, construction materials, and construction estimates.

Once the plans were prepared, they were presented to the Conservation District for approval. The plan included site preparation, earthwork, and landscaping. The Wildlife

Resources also reviewed and approved the plans, and provided a letter of support. A copy of the letter they provided is attached at the end of the report.

The Conservation District contracted with Nielson Construction, Inc. from Huntington, UT to construct the project.

While plans were being designed and approved, UDOT constructed their portion of the project within their right-of way. Their right-of-way project consisted of adding 40 feet of 36" culvert to the end of the existing culvert under the highway. The cost for labor, equipment, and materials was valued by UDOT at \$17,150.00.

Associated Section 319 project costs include \$11,200 for project design and engineering. The engineering firm was Desert Rose Environmental, LLC of Salt Lake City, Utah. Nielson Construction, Inc. from Huntington, Utah installed the designed project at a cost of \$14,500. UACD provided technical assistance and contract administration (\$16,300) for a total 319 project cost of \$42,000. Technical assistance included project coordination with the local watershed committee, UDOT, working with the land owner (Utah Wildlife Resources), arranging for engineering and project implementation, project inspections, planting willows, report writing, financial accounting, coordination with the local Conservation District, tracking the matching funds, travel costs, office expenses, and miscellaneous items.

Nielson Construction provided the traffic control signs (4) and orange barrels (30) for safety purposes. They laid back the vertical banks to a 2:1 slope. They hauled 60 ton of large rock to the site from another UDOT project at Colton, and installed the rock according to design. UDOT donated the rock valued at \$3,062.00 . After the rock was installed and the earthwork completed, the area was seeded with native seed donated by Utah Wildlife Resources, and an erosion control blanket was placed on the construction site to hold the soil in place until the vegetation established. The value of the donated seed was \$167.00.

The Conservation District provided tours of the project, before and after project completion.

The project was constructed in the fall of 2007. During the spring of 2008, Conservation District staff went to the site and planted willows. However, a single major storm event filled the structures with sediment covering over the willows that were planted. Efforts will be made in the spring of 2010 to replant willows.

Following are pictures of the gully prior to project design and implementation. The existing culvert was installed during construction of Highway 6 many years ago. The photos were taken at the time of a District tour of the project.



The photo on the right shows the UDOT culvert that extends into the gully. At the time the culvert was placed, there was no gully at the site. These pictures depict how one culvert can impact a watershed.



This photograph to the right shows the UDOT construction within their right-of-way. They extended the culvert past their property and placed some large rock to reduce velocity of water leaving the culvert. This was the primary source of match for the project. Their contribution amounted to \$17,150.00,



Below are photographs of Nielson Construction bringing rock to the site, installing the rock, and putting in the erosion control blanket.



The photograph at the right shows the planted vegetation growing through the control blanket.



This photograph shows the finished project one year later, and after the single major storm event that was mentioned earlier. Notice in the picture the amount of sediment that was contained with just one single storm event. This leaves us wondering if any projects can really be built that will contain the sediment that comes from the uplands during major storms. The soils in the area are not conducive to thriving plant populations.



## 2.1 Planned and Actual Milestones, Products, and Completion

Task	Planned Milestone	Actual Milestone	Products
1 – Modify gully	2004	2006	Landowner meetings, landowner agreements, UDOT cooperation, project design
2 – Install structures	2005	2007	Earthwork, rock riprap, erosion blanket
3- Seed gully	2005	2007	reseeding
4 – Monitor BMPs	2005	2008	Tours, PSIAC load calculations

### Completion Date of Project

The project was completed in 2007. The contract was amended one time to transfer the remaining \$90,000 to a 319 project on the Upper Sevier River. The completion date of the projects was within the timeframe of the contract.

## 2.2 Evaluation of Goal Achievement

Goal 1: The project goal is to implement BMPs that will achieve water quality standards to meet the criteria set for the designated beneficial uses for Soldier Creek and Spanish Fork River. The intent of the goal is to reduce sediment delivery to the streams, and provide education to the public.

Soil erosion is by far the largest source of sediment to Soldier Creek. Soil erosion rates in watershed range from 161 tons per acre to .24 tons per acre. About one third of the watershed soils have moderately high to very high erosion rates, from 1.6 tons per acre and above. These are estimates derived from soil surveys and an interagency Pacific Southwest Inter-Agency Committee (PSIAC, 1968) inventory completed in 2000. The highest potential for soil erosion occurs during snowmelt and isolated thunderstorms. The Table below shows a summary of soil erosion rates and how much of the Soldier Creek watershed is affected.

The gully project is within the area of the watershed categorized as have a “very high” erosion rate.

Erosion rates by acre and percent of sub-watershed are noted in the table below.

<b>Erosion Rate (tons/acre)</b>	<b>Acres</b>	<b>% of watershed</b>
Low (.6 and below)	7,144	5
Moderate (.7 – 1.5)	92,806	62
Moderately High (1.6 – 2.97)	16,635	11
High (2.98 – 8.7)	29,165	19
Very High (8.8+)	5,001	3

It was estimated in the original project proposal that the implemented gully project would reduce sediment delivered to Soldier Creek by 1,000 tons/year. Estimates from the single major storm event that occurred, following the project construction, indicates that the project trapped and contained 600 tons of sediment. Clearly, there was additional sediment that passed through the structure, but that amount is not known.

Goal 2: An additional goal is to develop a design that can be used on other culvert projects along US Highway 6.

This goal was not listed in the project proposal; however it seemed reasonable to take the information learned from this project and provide it to UDOT. They will be the ones to make the decisions as to whether this design is useful to them on other

culvert projects. The Conservation District has not followed up with UDOT to see if they are using similar designs with the road projects.

### 3.0 LONG TERM RESULTS IN TERMS OF BEHAVIOR MODIFICATION, STREAM/LAKE WATER QUALITY PROTECTION CHANGES, AND/OR WATERSHED PROTECTION CHANGES.

This is a single demonstration project in a large watershed with potential for large discharges of sediment into Soldier Creek. Singularly, this project will have little effect on the overall quality of water. However, it does serve as an example of a better design for a highway culvert that collects storm water and discharges over the land.

It is apparent from the amount of sediment in the structure installed, that it worked. It is thought that some additional willows planted in the gully will have a beneficial influence in the future to trap additional sediment and reduce additional erosion in the gully. As previously mentioned, Conservation District staff will plant additional willows in the spring of 2010.

No water quality monitoring data was collected from the project. The project did not require a Quality Assurance Project Plan (QAPP). The existing water quality data was insufficient to adequately determine implementation benefits. There were insufficient sites where data was collected.

### 4.0 BEST MANAGEMENT PRACTICES (BMPS) DEVELOPED AND/OR REVISED

The Best Management Practices that were installed included earthwork to reshape vertical banks to a 2:1 slope, rock installation to trap sediment and protect the gully from further erosion, rock work to reduce velocity of water, an erosion control blanket, reseeding of native vegetation for erosion control, and transplanting willows. The rock work will also protect the end of the culvert so that erosion does not undercut the culvert.

A private consulting engineer provided the technical assistance for project design and oversight of construction.

### 5.0 MONITORING RESULTS FOR DEMONSTRATION PROJECTS

Utah Wildlife Resources, NRCS, UACD and the local Conservation district monitored these projects during construction. Monitoring indicates that the projects were constructed as planned and BMPs were installed according to design.

#### 5.1 BMP Effectiveness Evaluations

Utah Wildlife Resources owns the land the project was constructed on. In the letter written by that agency dated October 18, 2007, they state that "We will also take responsibility for monitoring and spraying for noxious weeds within the project area after construction is complete."

## 5.2 Results of BMP Operation and Maintenance Reviews

Utah Wildlife Resources, UACD, and NRCS personnel have inspected the installed BMPs and have indicated that the BMPs are in a proper functioning condition, and are being maintained by the owner (Utah Wildlife Resources) as agreed.

## 6.0 PUBLIC INVOLVEMENT AND COORDINATION

The Timp-Nebo Conservation District provided the leadership on this project. The District has been involved and supportive since the beginning of the project. They have approved funding requests, design criteria, design changes, and tour coordination. The Spanish Fork watershed committee prepared the CRMP, and implemented this project.

Key to the project was the coordination with UDOT and Utah Wildlife Resources as the landowners.

### 6.1 State Agencies

Utah Department of Agriculture and Food (UDAF) – Contracting, project management, planning, information and education.

Utah Division of Wildlife Resources (DWR) – Landowner, provided design review, provided seed, provided trespass authorization.

Utah Department of Transportation (UDOT) – Owned right-of-way, provided access to project, constructed a portion of the project, provided the rocks, provided matching funds.

Utah Division of Water Quality/Utah Department of Environmental Quality (UDWQ/DEQ)– Statewide Section 319 program management including oversight of local 319 planning and expenditures and water quality monitoring in the Spanish Fork River.

### 6.2 Federal Agencies

Environmental Protection Agency (EPA) – Financial assistance from CWA Section 319 NPS Program.

### 6.3 Local Governments and Others

Cooperative Extension Service (ES) – Information and education of BMP effectiveness to local cooperators through tours, brochures and meetings.

Utah Association of Conservation Districts (UACD) – Approval of funding requests, match documentation, financial assistance, information and education, technical assistance.

### 6.4 Other Sources of Funds

The Utah Department of Transportation (UDOT) completed the work for this project that was within their highway right-of-way (\$17,150). UDOT also provided all of the large rock that used by Nielson Construction valued at \$3,000. The project outside of the UDOT right-of-way was on land owned by the Utah Division of Wildlife Resources. They provided staff to review the project, assure that the project would meet the requirements of their agency, wrote a letter authorizing the project to proceed, and they provided the seed for re-vegetation, and inspected the project during and after completion. The Timp-Nebo Conservation District provided local oversight and administration for the project, reviewed the design, approved payment of invoices, and inspected the project after construction. Additionally, after the project was completed, and with their own funds, the Conservation District returned to the project to harvest willows and plant them to further protect the project from erosion. The local Watershed Committee met quarterly throughout the project. The Utah Association of Conservation Districts (UACD) provided a portion of the match for the design and engineering. The required match was documented by UACD prior to any invoices being paid. The total match requirement of \$28,000 was met.

## 7.0 ASPECTS OF THE PROJECT THAT DID NOT WORK WELL

Initially the project was going to be engineered by NRCS. They were also going to provide the on-site inspections and make sure the project was installed using their standards. Their workload after the project was approved and funded, did not allow them to fulfill that commitment. As a result, the project was delayed to look for other engineering alternatives. It was finally decided to contract with a private consulting engineer. The project was implemented according to design. The cooperation of everyone involved with the project was great. The project functioned as designed,

however it filled with sediment faster than was anticipated. Willows that were planted were covered with the sediment. More willows will be planted in the spring of 2010.

#### 8.0 FUTURE ACTIVITY RECOMMENDATIONS

Work with other landowners on Thistle Creek and Soldier Creek to implement similar projects. The project was installed so that the land owner would not have to be subjected to long term maintenance. However, at some time in the future, it might be necessary to add more rock, thereby capturing more sediment. That may depend on how well the willows in the gully are holding back the sediment and reducing the velocity of water going through the gully.

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**State of Utah**  
 DEPARTMENT OF NATURAL RESOURCES  
 NICHOLS CENTER  
 260 SOUTH 1400 EAST  
 Division of Wildlife Resources  
 TAMMIE KASHOUEZ  
 Director

October 18, 2007

Dick Saunders  
 Chairman, Timpano Conservation District  
 301 East 1860 South  
 Provo, UT 84606

RE: Spanish Fork Canyon/Soldier Creek Erosion Control Structures

Dear Mr. Saunders:

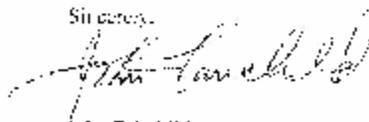
We have reviewed the final design for the Spanish Fork Canyon/Soldier Creek Erosion Control Structures with Keith Covington of the Timpano NCD and Ray Lovelace of MAG. The project site is located near milepost 205 along Highway 6 in Spanish Fork Canyon where a culvert collects runoff from several small drainages and discharges into Soldier Creek on Division of Wildlife Resources lands.

We generally concur with the concept of sloping the gully banks, installing two engineered check dams to collect sediment, and reseeding of all disturbed areas. However, the diagrams do not show that the structures will be keyed into the banks, and the General Construction Notes indicate that rock riprap will be placed on the surface. The diagrams also do not indicate a depression or spillway in the structures, where water can spill without eroding the structure. We feel that the ends of the check dams need to be keyed into the banks, and that spillways are placed in each dam. It has been our experience that structures that are not keyed into the bank and have no spillway will erode around the end of the structure and result in continued erosion problems. We recommend that the engineer who designed the structures be onsite to direct equipment operators on the proper placement and construction of the check dams.

The Division of Wildlife Resources will provide the seed for the contractor to complete revegetation of all disturbed areas. We will also take responsibility for monitoring and spraying for noxious weeds within the project area after construction is complete.

Please consider this letter as the official approval from DWR to complete construction as outlined in the approved plans and the additional recommendations included in this letter above.

If you have further questions, please contact Mr. Ashley Green, Habitat Manager at our Central Region Office in Springville (801-491-5654).

Sincerely,  
  
 John Fairchild,  
 Regional Supervisor

cc: Ray Lovelace, MAG  
 Keith Covington, Timpano NCD



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Drainage and Erosion Control  
 Project #B 4461  
 US-6 MP 205.1  
 Itemized expense list

Labor:		
265 manhours @ various labor rates		6907.05
Equipment		
Ten wheel dump trucks	130 hours @ 22.13 hr.	2876.90
09-03 loader	60 hours @ 13.43 hr.	805.80
09-02 loader	50 hours @ 10.50 hr.	525.00
19-45 pickup truck	560 miles @ .72 mi.	403.20
19-41 pickup truck	207 miles @ .62 mi.	128.34
Materials		
40 feet of 36" CMP culvert w/ bands		1033.72
750 cubic yards of borrow material @ 6.00 cy**		4500.00
Total value of project:		\$ 17,150.01

Work performed on this project took place from July 10 to July 20, 2006.

\*\* borrow material was taken from a nearby stockpile of cut ditch cleaning material. The \$6.00 cy estimate is using the current cost of roadway excavation costs.

\_\_\_\_\_  
 Dave Babcock  
 UDOT Roadway Operations Manager  
 North Area, Price District