

**Clean Water Act**  
**Section 319 Nonpoint Source Pollution Control**  
**Program**  
**Watershed Project Final Report**



**Chalk Creek Watershed Project – Summit County, Utah**

Project Sponsor  
Summit County Soil Conservation District

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This project was conducted in cooperation with the State of Utah and the United States Environmental Protection Agency, Region 8.

Grant #s: C9998187-90 thru -93; C9998187-95 thru -2000; and C9998187-02

## **EXECUTIVE SUMMARY**

PROJECT TITLE: Chalk Creek Watershed

PROJECT START DATE: October 1 1990

PROJECT COMPLETION DATE: October 1 2004

FUNDING:

TOTAL BUDGET: \$4,092,687

TOTAL EPA GRANT: \$2,265,420

### **SUMMARY OF FEDERAL 319 EXPENDITURES**

TOTAL EXPENDITURES  
OF EPA FUNDS: \$2,265,420

Projects (BMPs)	\$1,656,600
Tracking (admin)	80,820
Technical Assistance	474,400
Information & Education	<u>53,600</u>
<b>TOTAL</b>	<b>\$2,265,420</b>

TOTAL SECTION 319  
MATCH ACCRUED: \$1,502,371

OTHER FEDERAL  
FUNDS: \$324,896

BUDGET REVISIONS: \$0

TOTAL EXPENDITURES: \$4,092,687

### **SUMMARY ACCOMPLISHMENTS:**

<b>Chalk Creek TMDL Objectives</b>	
<b>OBJECTIVE</b>	<b>ACCOMPLISHMENTS</b>
1. Reduce sediment coming from rangeland by 130,000 tons/year.	Prescribed Grazing, Fencing, Water Development, and/or Brush Management have been applied in approximately ½ of the watershed area resulting in an estimated erosion reduction of 70,000 tons/year.
2. Protect and stabilize 10 miles of eroded streambanks / stream channel to reduce sediment by 8,200 tons/year, improve stream function and reduce flood damage.	Approximately 2.5 miles of eroding streambanks have been protected within 15 miles of stream channel that has been improved. This has resulted in an estimated reduction of 3168 tons/year.
3. Improve the pollutant filtering capabilities of the riparian area and flood plains by restoring vegetation to an effective condition.	Approximately 363 acres of riparian area in Chalk Creek have been excluded from grazing, implemented prescribed grazing, and/or planted woody vegetation.
4. Reduce impacts to water quality caused by excess deep percolation, surface runoff of irrigation water, and irrigation diversion maintenance.	Approximately 1200 acres including Coalville City have been converted from flood irrigation to sprinkler irrigation with the installation of a gravity flow sprinkler system.
5. Reduce gully erosion associated with road construction and off-road vehicle use.	No progress has been made towards this objective.
6. Control pollutants produced from oil, gas and mining activities.	Two coal mine sites have been reclaimed in the watershed.
7. Improve fishery habitat for game fish.	Occasional fish-shocking studies have shown that fisheries have been enhanced in Chalk Creek for Bonneville Cutthroat Trout.
8. Facilitate the development of an acceptable plan that will protect the natural resources and balance the harvest of wild game animals and economic returns throughout the watershed.	A non-profit corporation called the Chalk Creek Foundation has been formed to address this specific goal.

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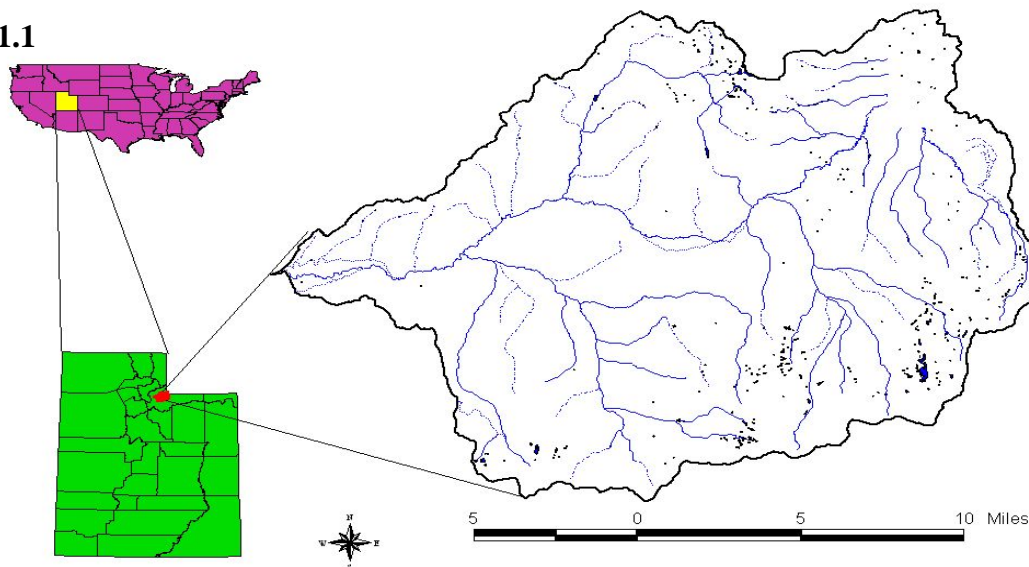
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## **1 INTRODUCTION**

### **1.1 Background**

Chalk Creek Watershed is located in Summit County, Utah. The watershed encompasses more than 176,000 acres of rangeland, forest, irrigated crop and pasture, meadow pasture and small urban areas. Land ownership is more than 99% private, with less than 1% controlled by the federal government. The Chalk Creek Watershed is on Utah's "High Priority List of Watersheds Needing Treatment" to meet water quality standards set by the state. Land use is primarily for livestock grazing, livestock feed production and as wildlife habitat. Trout habitat is one of the key beneficial uses of water in Chalk Creek. The watershed holds the largest documented population of Bonneville Cutthroat Trout yet discovered.

### **1.1**



**Figure 1** – Chalk Creek Watershed, HUC 16020101022. Mouth of watershed is at Coalville, Utah.

### **1.2 Water Quality**

Chalk Creek was the most impaired surface water listed on the Utah 303d list at the time of the project's inception. Chalk Creek is impaired due to sediment and phosphorus. Chalk Creek continues to be the major contributor of sediment to the Weber River. However, the majority of it settles out in Echo Reservoir and most of it is not carried downstream into the lower Weber River. The upper end of the reservoir is filling in and when the reservoir is drawn down completely, the sediment is down-cut by the river flowing through it and is carried down stream in the Weber River. Preliminary evaluations of sediment and phosphorus loadings comparing the pre-implementation period indicates

that there has been a reduction in total phosphorus loadings, but there is not a significant reduction in sediment loadings.

### 1.3 TMDL

The Chalk Creek NPS Water Quality Project began in 1991 when the Summit Soil Conservation District (SCD) organized a local steering committee to provide planning guidance decisions. The committee consists of elected officials, landowners, wildlife groups, irrigation companies and key agency personnel. The Coordinated Resource Management Plan (CRMP) process was followed and a CRM plan was published in 1994. The Chalk Creek CRMP has been accepted as the TMDL for this watershed. The objectives in the CRMP are:

1. Reduce sediment coming from rangeland by 130,000 tons/year.
2. Protect and stabilize 10 miles of eroded streambanks / stream channel to reduce sediment by 8,200 tons/year, improve stream function and reduce flood damage.
3. Improve the pollutant filtering capabilities of the riparian area and flood plains by restoring vegetation to an effective condition.
4. Reduce impacts to water quality caused by excess deep percolation, surface runoff of irrigation water, and irrigation diversion maintenance.
5. Reduce gully erosion associated with road construction and off-road vehicle use.
6. Control pollutants produced from oil, gas and mining activities.
7. Improve fishery habitat for game fish.
8. Facilitate the development of an acceptable plan that will protect the natural resources and balance the harvest of wild game animals and economic returns throughout the watershed.

### 1.4 General Project Description

In summary, the major goals of the project are to improve the overall quality of water within the watershed to meet state standards for the designated water uses by reducing the amount of sediment, animal waste and nutrients that enter Chalk Creek and Echo Reservoir, develop the fishery of both Chalk Creek and the Echo Reservoir to achieve their potential for fish production, reduce the sediment delivery from Chalk Creek to Echo Reservoir by achieving long term stability of stream channels, and stream banks, and provide protective cover to rangeland, and inform and educate the public concerning the causes of water quality problems and the need for everyone's involvement to solve these problems.

Project activities included the application of best management practices to improve the fishery value of the streams, reduce erosion of stream banks, reduce erosion of rangeland, prevent head cutting of streams, provide vegetative cover, wetland and riparian improvements, reduce nutrient and coliform impacts to streams and reservoirs and improve recreational opportunities.

Landowners have installed practices that have improved Chalk Creek's water quality and the overall health of the watershed. They have voluntarily adopted conservation practices such as sprinkler irrigation systems, stream bank protection, grazing management, riparian fences, mine reclamation, etc. to control erosion and reduce runoff of sediments into Chalk Creek.

## **2 PROJECT GOALS, OBJECTIVES, AND ACTIVITIES**

### **2.1 Goals**

The Goals listed are based on implementing the complete CRM Plan independent of funding sources. Best Management Practices (BMPs) will be implemented according to standards and specifications as identified in the State NPS Management Plan in an effort to accomplish the following goals.

Goal: I Achieve water quality standards that meet the criteria set, by the state of Utah, for the designated water uses and restore Chalk Creek to a stable, naturally reproducing trout fishery.

Goal: II Document Use of 319 Funding and evaluate program effectiveness.

Goal: III Gain public acceptance of NPS activities by informing and educating the community concerning NPS pollution and the importance of managing natural resources within the watershed.

### **2.2 Overall Goals, Objectives, and Tasks**

Goals and objectives were developed in a Coordinated Resource Management Plan (CRMP) for the entire watershed as listed below.

**Goal: I** Achieve water quality standards that meet the criteria set, by the state of Utah, for the designated water uses and restore Chalk Creek to a stable, naturally reproducing trout fishery.

**Objective I** Reduce sediment coming from 96,000 acres of eroding rangeland that is in poor condition by 130,000 tons/year.

**Task 1** Establish adequate vegetative cover on 3,000 acres of very poor condition rangeland located on south facing slopes by: spraying 1,000 acres to control cheat grass, seeding 3,000 acres with improved varieties of grasses, shrubs and forbs and by applying deferred grazing to 3,000 acres. . Livestock grazing will be controlled by installing fencing and livestock watering facilities. Herbicide application for sagebrush and weed control is a currently authorized practice and poses no long term threat to the environment. Brush and weed control practices are subject to NRCS Technical Guide specifications, EPA approved label directions, FIFRA guidelines, USU Extension Service

guidelines and recommendations, and The Utah Department of Agriculture spray applicators licensing requirements. Spray material will be applied by applicators who hold a current spray applicators license from the Utah Department of Agriculture. If chaining is selected as the most feasible method to control juniper invasions, adequate documentation for support, need and effectiveness will be submitted to EPA for approval before using 319 funds. When available, the most recent computer model programs will be used to help assess ground water conditions and needs. Careful evaluation and effort will be given to ensure that all species listed on state and federal endangered species lists, that are present in the project treatment area, will be protected.

Products: Establish suitable vegetative cover on 3000 acres, spray 1000 acres, reseed 3000 acres, install cross fencing and livestock water developments and deferred grazing on 3000 acres. Reduce sediment, with its attached phosphorous, by 24,000 tons annually.

Cost: \$70,000

**Task 2** Restore 2,000 acres of alluvial fans, located between the uplands and the streams, to their natural function as a filtering system. Clear 800 acres of junipers, mechanically or by hand, to reduce competition for moisture, so that more desirable protective ground cover can become established. Control 500 acres of sagebrush and reseed with desirable species of grasses to provide more ground cover. All chemical brush management BMPs will comply with federal, state and local laws. Gully erosion, will be controlled using grade stabilization structures of rock, cut junipers and/or woven wire fence. Construct a series of spreader ditches across the contour of alluvial fans to better spread the flow of runoff water and reduce the impacts of gully erosion. BMPs to be used in completing this task will include brush management, range seeding, critical area planting and stream channel stabilization.

Products: Treatment applied to 2000 acres of alluvial fans for vegetative cover improvement, resulting in reduced sediment input to Chalk Creek of 4,000 tons/yr.

Cost: \$80,000

**Task 3** Implement planned grazing management practices, including proper grazing use, on 96,000 acres of rangeland. Apply brush management practices on 10,000 acres. It is planned that these practices will improve the quality and quantity of vegetative cover as well as increase the water infiltration rate of the soil. Approximately 25,000 acres of this area are currently in poor condition. This task will include the management of practices applied in task 2.

Products: Planned Grazing System practices applied to 96,000 acres of rangeland to improve vegetative cover and to reduce the sediment yield with attached pollutants by 68,000 tons/yr.

Cost: Brush control \$250,000. Fencing and livestock water development \$500,000.  
Total: \$750,000

**Task 4** Implement BMPs that will reduce the sediment load to Chalk Creek produced from 7,000 acres of severely eroding rangeland in the upper Chalk Creek Basin. This improvement will be accomplished by seeding critical areas with adapted species of grass and forbs (1000 ac.), fencing (2.5 mi.) and by applying proper grazing management practices (7000 ac.). Riparian and wetland areas (500 ac.) will be reestablished along the stream in this area to provide sediment filtering capabilities. Dikes (7 ea) will be implemented to elevate ground water levels to facilitate the establishment of riparian vegetation. Small grade stabilization structures (7 ea) will be installed in this same general area to reduce down cutting of the stream and to elevate ground water levels. The majority of riparian and wetland improvements will be implemented in the Upper Chalk Creek Basin area.

Products: Treatment of 7,000 acres of severely eroding rangeland with grazing management practices including the above listed BMPs. Reduced sediment delivery by 105,000 tons per year to Chalk Creek. Critical areas seeding of 1000 acres, 2.5 miles of cross fencing installed, 7000 acres properly grazed, reestablish 500 acres of riparian and wetland pasture, properly manage the same acres, 7 dikes installed, 7 grade stabilization structures installed.

Cost: Total \$88,500

**Objective II** Stabilize and protect 10 miles of eroding stream banks/stream channel that will reduce sediment to Chalk Creek by 8,200 tons/year.

**Task 5** Stabilize 3 miles of stream channel bottom that is down cutting by implementing grade stabilization structures, structures for water control at irrigation diversion points and by clearing trees and other debris that misdirect flows and create bank erosion problems.

Products: Stabilized stream channel of 3 miles by: constructing 30 structures (V weirs, jetties, and drop structures) to reduce sediment produced by channel head cutting and eroding stream banks. Sediment load with associated phosphorus will be reduced by 800 tons per year. Ground water table of the flood plain will be stabilized and fish habitat will be improved for 3 miles.

Cost: Approximately 30 structures @ \$2,000 each = \$60,000.

**Task 6** Stabilize 5 miles of stream banks, critical to the stability of 25 miles of stream corridor, that contain steep eroding stream banks. The following BMPs will be implemented: livestock exclusion, fencing, livestock water development, grazing management practices, critical area planting, tree revetment, jetties & barbs and rip-rap. The rip-rap may be needed in some areas to stabilize banks until the protective vegetation and land treatment practices become established.

Products: Stabilized stream banks of 5 miles. Reduced sediment loading to Chalk Creek by 2400 tons annually along with associated phosphorus and coliform bacteria. Improved fish habitat, and reduced flood damage losses.

Costs: Stream bank stabilization, critical area planting, tree revetment, jetties, fencing and barbs - \$130,000.

**Task 7** Reconstruct 5.2 miles of braided channel into a single meandering channel. BMPs to be implemented will include those practices listed on page 17 of the Chalk Creek Coordinated Resource Management Plan. See appendices. Stream rehabilitation includes restored water table and vegetative growth to former levels that allow the flood plain to function as it should. Both wildlife and fish habitat will improve.

Products: Restored stream channel of 5.2 miles. Approximately 3,000 tons of sediment will be held in place. Restored wildlife and fisheries habitat of 5.2 miles.

Costs: Meander reconstruction - \$520,000.

**Task 8** Reduce erosion produced from an active landslide area by relocating 0.8 miles of stream channel away from the toe of the area.

Products: Relocated stream channel of 0.8 mile to keep 8,000 tons of sediment per year out of Chalk Creek.

Cost: Protective relocation - \$42,000.

**Task 9** Protect stream banks and reduce erosion at road bridges. BMPs used will include Stream bank Protection, Stream Channel Stabilization, Channel Vegetation, Critical Area Planting, Livestock Exclusion, Fencing, Deferred Grazing, and Bridge Reconstruction.

Products: Bridge sites protected against Stream bank erosion at 8 crossing sites to keep 400 tons of sediment per year (with associated phosphorus & other pollutants) out of the stream.

Cost: Eight (8) sites @ \$4,000 = \$32,000.

**Task 10** Apply BMPs to the tributaries (18 ea) of Chalk Creek that will reduce channel head cutting. Related BMPs are found on page 18 of the Chalk Creek Coordinated Resource Management Plan. (See appendices.)

Products: 18 tributaries treated to stop head cutting and to restore riparian vegetation, water table levels, fish and wildlife habitat and to restore to a functional condition. Sediment will also be reduced by 400 tons per year.

Cost: \$28,000

**Objective III** Improve the filtering capabilities of 500 acres of riparian area and flood plains.

**Task 11** Restore 500 acres of over-grazed, vegetatively impaired riparian areas to a condition of hydrologic integrity. Re-vegetate 50 acres with shrubs, grasses, sedges, cottonwoods, willows and other riparian species. Livestock will be excluded from 100 acres with 400 acres rested from grazing until vegetative cover is established. Riparian area management plans will be established that will include 90 miles of cross fencing along with some corridor fencing and livestock watering facilities.

Products: Restore 500 acres of riparian area by: Re-vegetate fifty (50) acres of depleted riparian area, exclude livestock from 100 acres, construct 54 miles of fence, install 104 livestock watering facilities and rest 400 acres of riparian area until vegetative cover improves to the desired level. Approximately 12,000 tons of sediment will be held in place annually.

Cost: Fencing - \$270,000, livestock watering facilities - \$391,000, planting & grazing management - \$36,000. Total = \$697,000.

**Objective IV** Reduce impacts to water quality caused by excess deep percolation, by surface runoff water, by animal waste and from irrigation practices.

**Task 12** Reorganize the irrigation delivery system, to be more efficient, by consolidating diversions and ditches. Consolidate and improve (strengthen) irrigation diversion structures. Approximately 13 structures would be constructed consolidating 18 into 13.

Products: Consolidation of irrigation structures from 18 to 13. Reduced sediment loading to Chalk Creek and Echo Reservoir, improved stability of stream banks at diversion sites, improved irrigation efficiency and reduced deep percolation. The above action will also enhance fisheries value of the stream.

Cost: \$84,000.

**Task 13** The FY 2002 funds, in combination with other funding, will be used to install 40 gravity flow sprinkling system on 930 acres of irrigated pasture and hayland.

Products: Forty (40) sprinkler irrigation systems installed, reduced bank sloughing along 3 miles of stream. Reduced amount of irrigation water applied resulting in reduced deep percolation. Animal waste and fertilizers will not be flushed off of the fields into the streams. Reduce the overloading problem to the Coalville sewer system. The value of Chalk Creek, as a fishery, will improve by having a more stable stream flow. Reduced sediment from unstable ditch banks.

Cost: \$2,200,000 (FY 2002 funds contributed to this total are \$172,000.) This will be added to previous FY funding (see page 4) and matching funds from the irrigation company and Coalville City.)

**Task 14** Improve irrigation efficiencies to 55% on 2820 acres. Practices that improve irrigation efficiencies will be applied.

Products: Irrigation efficiency improved to 55 % or better and nutrient leaching controlled.

Cost: Included in task 13.

**Task 15** Implement BMPs to control and manage animal waste pollutants coming from dairies and feedlots. BMPs will include needs for Waste Management Systems & Waste Utilization Plans and will be directed to reduce the amount of coliform, nitrogen and phosphorus that enter the Chalk Creek water system.

Products: Liquid and solid waste storage facilities constructed for one (1) dairy with 150 animals and two (2) feedlot operations averaging approximately 100 animals each. Animal waste management plans implemented for each operation.

Costs: \$100,000

**Objective V** Reduce erosion and sediment associated with road construction activities and off-road vehicle use.

**Task 16** Construct water bars and sediment retention ponds along access roads and trails.

Products: Three hundred (300) water bars and one hundred (100) sediment ponds constructed to prevent 6,000 tons of sediment from getting into Chalk Creek annually. Provide livestock watering holes to be used by livestock and wildlife.

Cost: Construct 300 bars and 100 sediment ponds = \$80,000.

**Objective VI** Reduce pollutants coming from oil, gas, and mining activities.

**\*Task 17** Control sediment and runoff coming from oil, gas and mining exploration sites by: Grading, shaping, and reseeding well sites; install contour filter strips and controlled drainage outlets on small bare oil, gas, and mine exploration sites totaling 1,500 acres.

Products: Fifteen hundred (1500) acres seeded, one hundred (100) sediment ponds constructed, one hundred (100) gully plugs installed, over 100 acres graded and shaped around pad sites and twenty five (25) acres of filter strip installed. These practices will prevent 10,000 tons of sediment along with oil, gas, and mine contaminants from entering the waters of Chalk Creek.

Cost: \$45,000

**Objective VII** Implement BMPs that will improve water quality to provide desirable fishery habitat, meet state water quality standards and enhance recreational assets for the local community and others.

**\*Task 18** Develop 40 miles of stream into a stable, naturally reproducing trout fishery by: (1) Reducing the width/depth ratio in approximately 14 miles of stream channel by protecting it from continued erosion. (2) Plant shrubby vegetation along 10-12 miles of Stream bank to provide shade and protection. (3) Provide access for spawning fish to move upstream. (4) Implement irrigation system improvements and irrigation water management practices. (5) Protect 500 acres of riparian area from overgrazing.

Products: Forty (40) miles of stream capable of producing 200 lbs of fish per acre. Rock fish ladders will be installed in the main channel of Chalk Creek to provide for spawning. All state water quality standards achieved for this streams use designation.

Cost: Rock structure fish ladder - \$25,000.

**Objective VIII** Facilitate the development and implementation of an acceptable watershed improvement plan that will emphasize the protection of natural resources and balances the harvest of wild game animals with economic returns.

**\*Task 19** Develop a Wildlife Hunting Unit Management Plan for the watershed that will provide incentives for improvement and control and that will distribute proceeds from the sale of hunting rights on an equitable basis for all landowners.

Products: One (1) Hunting Unit Plan developed for the watershed that directs the management of wildlife and forage resources. Improved relations between landowners and DWR. Improved relations among landowners within the watershed.

Cost: Associated costs will generally be for time spent at planning meetings to bring agencies and landowners together. \$15,000.

**\*Task 20** Develop and implement a Beaver Control Management Plan, with applicable BMPs, that will reduce or eliminate the resource damaging problems related to the heavy Beaver use of this watershed. When this plan is completed DWR will clear the way to issue nuisance beaver trapping permits throughout the chalk Creek drainage. In the event that 319 funds are requested for implementation of the BMPs related to this practice the appropriate approval will also be requested from EPA and all other parties involved.

Products: One (1) Management Plan, with approved BMPs, for the control of nuisance Beaver that will facilitate the accomplishment of Objectives II & III which establish bank protection and improve the filtering function of the riparian zone flood plain. This action will also reduce the costs of maintaining irrigation systems.

Cost: \$50,000

**Task 21** Develop individual Resource Management System Plans that will bring about more efficient and wise use of natural resources on private lands as well as accomplish the desired reduction in NPS pollutants. Provide the technical assistance (TA) necessary to implement water quality improvement BMPs shown in each plan.

Products: NRCS & UACD will assist cooperators in the development of 56 Resource Management System (RMS) plans and in implementing the applicable BMPs. TA = 14 man years (3.5 man yrs/yr X 4 yrs).

Cost: Resource plans = \$112,000. TA = \$784,000. Total = \$896,000.

**Task UN** Develop Operation & Maintenance plan agreements for all installed BMPs to ensure life span.

Products: NRCS will assist cooperators in the development of O&M plans for installed BMP's and ensure that the contract obligation of 10 years will be met.

**Goal: II** Document Use of 319 Funding and evaluate program effectiveness.

**Objective I** UDA in cooperation with UACD will maintain a system of record keeping that will track the use of EPA 319 funds and matching funds of local participants to facilitate an evaluation of the effectiveness of all implemented practices.

**\*Task UN** Document the use of 319 funds and administer contracting responsibilities.

Product: Contract developed and signed by UDA & UACD. Quarterly, annual and final project reports. Documentation and evaluation reports.

Cost: 5 yr = \$66,700.

**\*Task UN** SCS, DEQ, and UDA will jointly evaluate data from monitoring records & etc to determine the effectiveness of all implemented BMPs Quarterly and Annual Reports will be completed and sent to all who request them.

Product: Final Progress and Evaluation report.

Cost: \$53,000 over 5 yrs.

**\*Task UN** UACD will develop individual contracts with cooperators that will identify planned use of 319 funds, track expenditures of 319 funds and track match.

Product: Contracts (56 ea) with individual producers.

Cost: \$60,000 over 4 yrs.

**Goal III** Gain public acceptance of NPS activities by informing and educating the community concerning NPS pollution and the importance of managing natural resources within the watershed.

**Objective 1** Inform and educate landowners and the public of the need to be involved in an effort to improve and maintain the quality of water for the benefit of everyone.

**Task 22** SCD Information Specialist will work with the Project Coordinator to prepare and publish newspaper articles, concerning NPS activities in the watershed, for publication in local and state newspapers. Prepare watershed quarterly newsletter.

Product: Four (4 ea) news articles/feature stories per year for 5 years) = \$200/yr X 5 yrs = \$1000.  
Four quarterly newsletters each year for 5 years = 20 ea @ \$500 = \$10000.

Cost: \$11,000

**Task 23** SCD and Information Specialist will work with the Project Coordinator to produce videos that will show conditions in the watershed before project improvement began, during implementation and after implementation.

Product: Three (3 ea) videos at \$2,000 each = \$6,000.

Cost: \$6000

**Task 24** The FY 2002 funds will be used for the SCD Information Specialist and Project Coordinator to plan, organize and direct tours of the watershed to inform the landowners, operators and public of the planned improvements for control of NPS pollutants within the watershed and the expected benefits. Also assist project cooperators by educating them about sprinkler irrigation and funding sources.

Product: One (1 ea) tour per year for 5 years at \$1,000 each.

Cost: \$5000.

The implementation of this PIP will begin with the implementation of management BMPs in the upper watershed and generally proceed downstream toward Coalville and Echo Reservoir in the lower valley. There will be times when Stream bank stabilization practices, grade stabilization structures and vegetative riparian area improvement practices may be implemented at the same time or shortly thereafter to provide the necessary control needed for establishment of vegetative cover.

### **2.3 Planned and Actual Milestones, Products, and Completion Dates**

The following milestone table (Table 1, pp. 14-23) describes the milestones, products, and completion dates.

## MILESTONE TABLE FOR CHALK CREEK WATERSHED PROJECT

TASK/RESPONSIBLE ORGANIZATIONS	OUTPUT	QTY	YEAR															
			1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total Quantity Accomplished
Goal # 1 Objective # 1																		
Task 1 - Reestablish vegetative cover of rangeland by seeding. Groups 1, 2, 7, 8, 9.	Protective vegetative cover. Spray weeds. Seed. Reduced soil erosion and sediment production.	3,000 ac 1,000 ac 3,000 ac 24,000 t /y							x		x				x			Establishment of protective vegetative cover by seeding 2231 acres
Task 2 - Restore alluvial fans to natural filtering function. Groups 1, 2, 7, 8, 9.	Restored vegetative cover to alluvial fans. Reduce sediment yield. Brush management.	50 ac 100 t/yr 50 ac			x					x		x	x					Vegetative cover restored through 17,200 feet of fence, 8,223 acres of brush mgmt., and 17 ac of tree and shrub establishment.
Task 3 - Implement BMPs on 96,000 acres of rangeland that will protect soil and increase water infiltration ability. Groups 1, 2, 7, 8, 9.	Planned grazing system. Proper grazing use. Sediment reduction. Brush management. Fencing. Livestock water.	96,000 ac 96,000 ac 68,000 t/y 6,000 ac 50 mi 150 ea		x	X	X	X	X	X	X	X	X	X	x				Prescribed Grazing on 42,850 acres facilitated by 3335 ac. of brush mgmt., 68,143 feet of fence, 5585 ft. of pipeline, 4 spring developments and 9 troughs.
Task 4 - Implement BMPs that will reduce sediment coming from 7000 ac of severely eroding rangeland in Upper Chalk Creek. Groups 1, 2, 7, 8, 9.	Critical area planting. Grazing Management. Riparian area/wetland restoration. Sediment reduction. Proper grazing use.	1,000 ac 7,000 ac 500 ac 105,000 T/y 7,000 ac			X					X		X	X	X	X			Prescribed Grazing on 7,653 acres facilitated by 15,088 feet of fence and 8205 acres of brush management.

**Group 1** - Natural Resources Conservation Service - Provide technical assistance to plan, design, and implement BMPs. **Group 2** - Landowners - Make land management decisions and provide cash and in-kind match for BMPs. **Group 3** - Soil Conservation District - Local project manager and sponsor, including responsibilities for project coordination, reimbursement payments, match tracking, and progress reporting to the State DEQ. **Group 4** - Utah Department of Environmental Quality - Statewide Section 319 program management including oversight of local 319 planning and expenditures. **Group 5** - Utah Department of Agriculture - Responsible for Ag NPS Program. **Group 6** - Cooperative Extension Service - Information & Education responsibilities, planning assistance. **Group 7** - Division of Wildlife Resources - Technical assistance, planning for wildlife resources. **Group 8** - FSA - Funding (Grant). **Group 9** - EPA - 319 funding. **Group 10** - UACD - Contract, tracking & records.

## MILESTONE TABLE FOR CHALK CREEK WATERSHED PROJECT

TASK/RESPONSIBLE ORGANIZATIONS	OUTPUT	QTY	YEAR													Total Quantity Accomplished		
			1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003		2004	2005
Goal # 1 Objective # 2																		
Task 5 - Stabilize and Protect stream channel from down cutting. Groups 1, 2, 7, 8, 9.	Stabilize stream channel. Structures. Reduced sediment load. Improved fisheries habitat.	3 miles 30 ea 800 t/y 3 mi					X	X		X	X			X				19 vortex rock weir structures stabilizing approx. 5 miles of channel from downcutting
Task 6 - Stabilize and protect stream banks. Groups 1, 2, 7, 8, 9.	Stabilize stream banks. Reduced sediment, P, N and coliform. Stream bank protection barbs Grazing management fencing.	5 miles  2400 t/y 5 mi 352 ea 100 ac 6 mi					X	X	X	X	X	X	X	x				17004 feet of streambank protection including approximately 560 rock barb structures, 6 vortex rock weir structures, and 340 feet of clearing and snagging. Fencing and grazing management was also accomplished, but reported under tasks 3 and 11.
Task 7 - Reconstruct reaches of braided unstable stream channel. Groups 1, 2, 7, 8, 9.	Meander reconstruction. Fish habitat improvement. Sediment reduction. Fencing Tree & shrub revetment	1800 ft 1800 ft 196 t/y 3 mi 1500 ft												x				4000 feet of braided channel restored with new channel construction, rock barbs, vortex weirs, willow plantings, fencing and use exclusion
Task 8 - Channel relocation away from land slide area. Groups 1, 2, 7, 8, 9.	Channel relocation and meander construction.	0.8 mi																Not yet completed due to land ownership issues (see report)
Task 9 - Stream bank protection at bridge crossings. Groups 1, 2, 7, 8, 9.	Protect bridge crossings. Reduced amounts of sediment and other pollutants entering the stream.	8 ea  400 t/y					X	X	X	X	X	X	X	X	X			Incorporated in projects reported under task 6. Approximately 3 bridges protected.
Task 10 - Prevent head cutting of tributary streams. Groups 1, 2, 7, 8, 9	Halt head cutting of tributaries. Reduction in sediment.	18 ea 400 t/y											x					3 ponds constructed to prevent head cutting of tributary streams.

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TASK/RESPONSIBLE ORGANIZATIONS	OUTPUT	QTY	YEAR													Total Quantity Accomplished		
			1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003		2004	2005
Goal # 1 Objective # 3																		
Task 11 - Riparian area restoration to hydrologic integrity. Groups 1, 2, 7, 8, 9	Re-vegetate - dormant & seeding. Sediment reduction. Riparian area grazing management. Fencing. Water development.	50 ac. 120 t/y  50 ac 3 mi 5 ea					X	X	X	X	X	X			X	X		9432 linear feet of channel vegetation, 13 acres of Riparian Forest Buffer, 4 acres of critical area planting, 66138 feet of fence, 339 acres of use exclusion, and 7715 acres of prescribed grazing.

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## MILESTONE TABLE FOR CHALK CREEK WATERSHED PROJECT

TASK/RESPONSIBLE ORGANIZATIONS  Goal # 1 Objective # 4	OUTPUT	QTY	YEAR													Total Quantity Accomplished	
			1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003		2004
<b>Task 12</b> - Irrigation system reorganization & improvements. Groups 1, 2, 5, 8, 9	Consolidate irrigation diversion structures. Improved irrigation control. Improved fish habitat.	13 ea 310 ac 1 mi			X	X						X					37 acres of irrigated land with improved diversion structures in the upper watershed. Consolidated 5 irrigation diversions in the lower watershed.
<b>Task 13</b> - Gravity flow sprinkling systems. Groups 1, 2, 5, 8, 9	Irrigation systems. Irrigation water mgmt. Reduced seepage loss & deep percolation. Reduced Stream bank erosion & sloughing. Stable water supply for fisheries.	50 ea 900 ac  100 a f 390 t/y										x					Installed a gravity flow sprinkler irrigation system for 900 acres in the lower watershed to replace the existing flood irrigation system.
<b>Task 14</b> - Irrigation water management. Groups 1, 2, 5, 8, 9	Improved irrigation efficiency. Stabilized stream flows.	900 ac		X	X	X		X					X				1004 acres of improved irrigation efficiency and proper irrigation water management
<b>Task 15</b> - Animal waste management. Groups 1, 2, 4, 6, 9	Manure storage structures. Waste management systems.	1 ea 1 ea															No structure necessary due to the only dairy in the watershed going out of business.

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**MILESTONE TABLE FOR CHALK CREEK WATERSHED PROJECT**

TASK/RESPONSIBLE ORGANIZATIONS	OUTPUT	QTY	YEAR															
			1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total Quantity Accomplished
Goal # 1 Objective # 1																		
Task 16 - Construct water bars and erosion control check ponds along access roads and trails. Group 1, 2, 9	Road water bars. Sediment ponds. Control gully erosion & reduce sediment coming from road construction and off road vehicle use.	300 ea 100 ea  6000 t/y																Nothing accomplished for this task

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## MILESTONE TABLE FOR CHALK CREEK WATERSHED PROJECT

TASK/RESPONSIBLE ORGANIZATIONS  Goal # 1 Objective # 1	OUTPUT	QTY	YEAR															Total Quantity Accomplished
			1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	
<b>Task 17</b> – Control sediment & other pollutants coming from oil, gas and mining activities. Groups 1, 2, 4, 9.	Disturbed areas graded, shaped and seeded. Sediment control ponds installed. Gully plugs.	100 ac 2 ea 10 ea				X					X							38 acres of abandoned mine reclamation was done on 2 different sites.

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TASK/RESPONSIBLE ORGANIZATIONS	OUTPUT	QTY	YEAR														Total Quantity Accomplished	
			1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004		2005
Goal # 1 Objective # 1																		
Task 18 - Develop 40 miles of streams into a stable, reproducing trout fishery. Groups 1, 2, 4, 5, 6, 7, 8, 9.	Forty (40) miles of improved fish habitat.	40 mi	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	Through the accomplishment of other tasks, approximately 29 miles of Chalk Creek and it's tributaries have been adequately restored and protected for fish habitat.

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TASK/RESPONSIBLE ORGANIZATIONS  Goal # 1 Objective # 1	OUTPUT	QTY	YEAR													Total Quantity Accomplished		
			1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003		2004	2005
<u>Task 19</u> - Develop watershed wildlife hunting plan. Groups 1, 2, 5, 6, 7	Hunting Unit Plan. More equal share of economic returns. Better relations between landowners & DWR.	1 plan											X					This task was accomplished by the formation of a non profit group called the Chalk Creek Foundation who will seek to resolve these issues.
<u>Task 20</u> - Develop and implement a Beaver Control Management Plan for nuisance Beaver. Groups 2, 7	Management plan. Stream bank protection. Reduced maintenance costs.	1 ea 4-6 mi																This task was not completed.
<u>Task 21</u> - Develop individual Resource Management System (RMS) Plans and provide tech assist. Groups 1, 3	Resource Mgt Plans (56 ea.). Plan implementation. (14 staff yr).	50 ea. 3 staff yrs. 1 staff yrs.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	x	Approximately 15 staff years were devoted to working with landowners to accomplish this task. 90 conservation plans with landowners in the watershed resulted.
<u>Task UN</u> – Develop O&M Plan Agreements for the BMP’s installed.	O&M Plan Agreements for the Gravity Flow Sprinkler System for the 10 year contract period.	1 ea												x				An O&M plan was developed for the new irrigation system.

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TASK/RESPONSIBLE ORGANIZATIONS  Goal # 1 Objective # 1	OUTPUT	QTY	YEAR															Total Quantity Accomplished
			1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	
<b>Task UN</b> - Document the use of 319 funds, matching funds, program effectiveness & administer contract responsibilities. Groups 1, 3, 5, 10	Contracts. Quarterly reports. Annual report. Final report.	10 ea 4 ea 1 ea 1 ea	X	X	X	X	X	X	X	X	X	X	X	X	X	X		9 project implementation plans were completed during the life of the project. All quarterly and annual reports were completed.
<b>Task UN</b> - Evaluate water quality monitoring data to determine effectiveness of BMPs on water quality. Groups 1, 4, 5, 6, 7	Final Report.	1 ea															X	A final report was completed.
<b>Task UN</b> - Develop individual contracts to track use of 319 funds by individual cooperators. Group 5, 10	Prepare & Track individual contracts.	10 ea	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	All funds tracking was completed by UACD.

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TASK/RESPONSIBLE ORGANIZATIONS  Goal # 1 Objective # 1	OUTPUT	QTY	YEAR														
			1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Task 22 - Watershed NPS information. Groups - 1, 6	Provide one on one assistance to landowners affected by the BMP's.	30 ea									X	X	X				One on one assistance was provided to approximately 50 landowners.
Task 23 - Produce videos of before, during implementation and after implementation of BMPs. Groups 1, 6	Videos, add to existing video	1 ea								X			X				A video about the project was completed and later updated.
Task 24 - Plan and conduct tours of the project area to inform and educate landowners and public. Groups 1, 6	Tours  Plaques	3 ea  4 - 8 ea.		X	X	X	X	X	X	X	X	X	X	X	X	X	Approximately 8 watershed tours were conducted during the project. Recognition signs were produced and provided to cooperating landowners.

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## 2.4 Evaluation of Goal Achievement and Relationship to the State NPS Management Plan

A summary of the accomplishments for the Chalk Creek watershed is provided in Table 2 below:

<b>Chalk Creek TMDL Objectives</b>	
<b>OBJECTIVE</b>	<b>ACCOMPLISHMENTS</b>
1. Reduce sediment coming from rangeland by 130,000 tons/year.	Prescribed Grazing, Fencing, Water Development, and/or Brush Management have been applied in approximately ½ of the watershed area resulting in an estimated erosion reduction of 70,000 tons/year.
2. Protect and stabilize 10 miles of eroded streambanks / stream channel to reduce sediment by 8,200 tons/year, improve stream function and reduce flood damage.	Approximately 2.5 miles of eroding streambanks have been protected within 15 miles of stream channel that has been improved. This has resulted in an estimated reduction of 3168 tons/year.
3. Improve the pollutant filtering capabilities of the riparian area and flood plains by restoring vegetation to an effective condition.	Approximately 363 acres of riparian area in Chalk Creek have been excluded from grazing, implemented prescribed grazing, and/or planted woody vegetation.
4. Reduce impacts to water quality caused by excess deep percolation, surface runoff of irrigation water, and irrigation diversion maintenance.	Approximately 1200 acres including Coalville City have been converted from flood irrigation to sprinkler irrigation with the installation of a gravity flow sprinkler system.
5. Reduce gully erosion associated with road construction and off-road vehicle use.	No progress has been made towards this objective.
6. Control pollutants produced from oil, gas and mining activities.	Two coal mine sites have been reclaimed in the watershed.
7. Improve fishery habitat for game fish.	Occasional fish-shocking studies have shown that fisheries have been enhanced in Chalk Creek for Bonneville Cutthroat Trout.
8. Facilitate the development of an acceptable plan that will protect the natural resources and balance the harvest of wild game animals and economic returns throughout the watershed.	A non-profit corporation called the Chalk Creek Foundation has been formed to address this specific goal.

Table 2

## 2.5 Supplemental Information

A photographic history of a typical restoration site along Chalk creek show the improvements realized from the improved grazing and fencing projects done in the watershed.

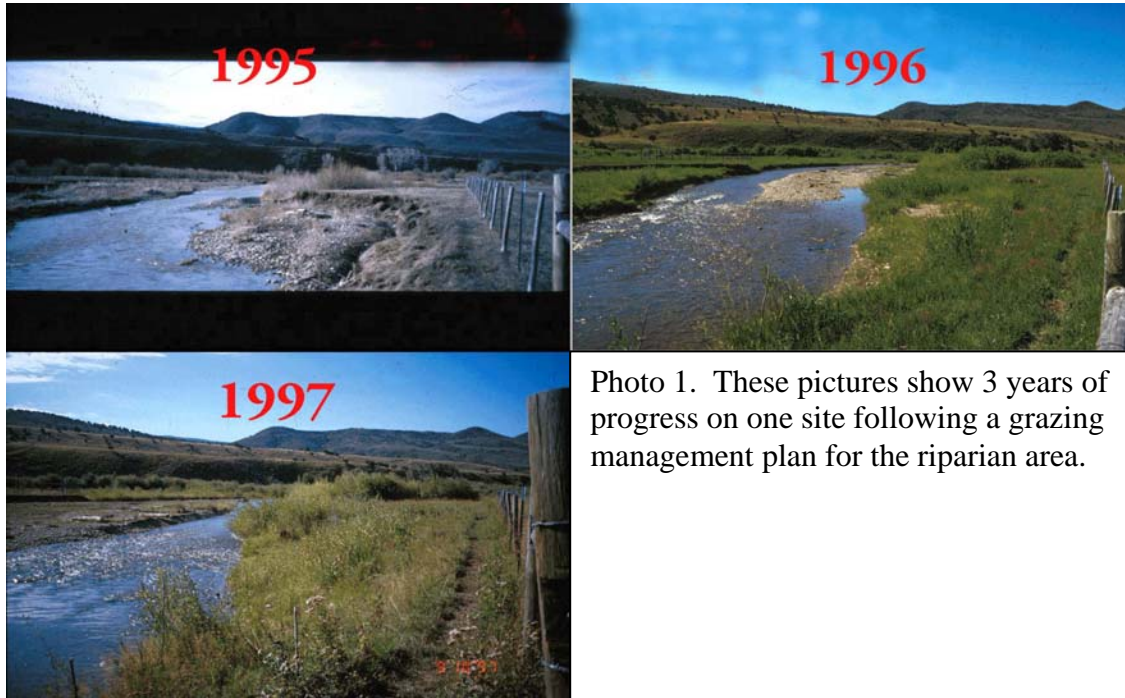


Photo 1. These pictures show 3 years of progress on one site following a grazing management plan for the riparian area.

One of the major undertakings in the Chalk Creek project was the conversion of flood irrigation to sprinkler irrigation which required combining several flood irrigation companies into a single pipeline project. A description of this portion of the Chalk Creek project follows:

### 1. Background

The Chalk Creek Sprinkler Irrigation Project is an integral component of the Chalk Creek Water Quality Project. Its expected effect was to enhance water quality within the basin by eliminating irrigation return flows, reducing nutrient loading and reducing stream bank erosion along the main stem of lower Chalk Creek.

NRCS has been the lead agency from project implementation to completion. After a number of years of preliminary surveys, designs and securing construction easements, construction was initiated during the winter of 2001-02. The system involved the installation of 23 miles of pipe ranging in size from 36" to 1 1/2". The system was completed and began operation in May of 2002.

Benefits of the new system are numerous, however there are some negative aspects associated with the project that should be noted. Some were anticipated and others were not.

Following is a description of some of the effects of the Chalk Creek Sprinkler Irrigation Project.

## 2. Effects to Agriculture

Throughout the completion of the project NRCS has been in contact with producers to determine the impact the new system has had on their operations. After discussions with the irrigation company president and other producers in the area there were a number of common themes. These are presented below.

A. Sprinkler irrigation has produced higher yields of production. This is due to a number of factors. Sprinklers provide a more uniform/even distribution of water as opposed to flood irrigation. Slope/geography does not have such a negative impact. Because of the slope of these pastures, flood irrigation could not adequately distribute water; the water would simply run off before percolation could occur. Typically the top of the pastures would burn up by July because of the inability to keep water on them. Since the change to sprinkler irrigation the pastures have remained productive throughout the summer.

B. Water turns were eliminated with the new system. Under the old flood irrigation system there was down time waiting for water turns. Now with the new sprinkler system, as soon as the hay crop is out of the field watering can begin again; unlike past years where you may have to wait days for a water turn. Also there is no downtime for plant growth. Plants are actively growing all the time while sprinkling, unlike the flood system where plant growth, particularly grasses are retarded while the plants are submerged.



Photo 2. The new pressurized system has eliminated water turns and allowed producers to water at their convenience in addition to increasing overall production. This has eliminated the need for maintenance of ditches and head-gates associated with the old flood system.



Photo 3. This portion of the Chalk Creek ditch in the “narrows” illustrates one of the problems associated with the previous less efficient flood irrigation system. Here attempts were made to line the ditch with plastic in order to prevent water loss from seepage which resulted in significant water loss and ditch failure.

C. Watering efficiency has increased providing numerous benefits. The amount of water required to sprinkle irrigate the same amount of acreage that was once flood irrigated has been significantly reduced. Currently about 1000 acres of agricultural land are being irrigated with the system. All water that enters the pipe at the point of diversion is distributed and is not lost to percolation or evaporation from ditches. Water usage is down which in turn helps to maintain in stream flows. Chalk Creek Irrigation Company estimates that there has been a 40% savings annually in the amount of water used since converting from flood to sprinkle irrigation. The typical irrigation season in Chalk Creek under flood irrigation may have ended around mid July because of a lack of water and even earlier in drought years such as last year. In its first year of operation, one of the driest on record, the irrigation season was stretched through the entire summer. Numerous producers have commented that their crops would have burnt right up in 2002 under the old flood irrigation system.

D. Private water held in storage was released throughout the summer from high mountain reservoirs. This allowed shareholders of this private water to sell excess water to those who did not have shares of private water. This provided a double benefit by allowing private water shareholders to earn extra income from their excess water shares and at the same time provide water to non-shareholders whom otherwise

would have been out of water. In addition the releases of private water helped maintain critical in stream flows above the diversion.



Photo 4. Above the diversion In-stream flows are significantly enhanced by privately owned water being released from a storage reservoir in the East Fork of Chalk Creek. View of new diversion structure across Chalk Creek in the narrows, 8/18/03.

E. Reduction in the spread of noxious weeds. Producers also mentioned that there has been a reduction in the spread of noxious weeds. With the old flood system the ditches acted as conveyors for weed seeds which could be carried throughout the lower valley by the flowing water in the ditches. Having the water enclosed in a pipe has reduced the infiltration and conveyance of noxious weed seeds.

F. Increased cost for shareholders. With the implementation of the project shareholders were faced with a significant cost increase. Assessments for water shares doubled from \$20.00/share to \$40.00/share to help pay for the system. In addition the cost of wheel-line or hand-line is a significant investment for producers, particularly those with smaller acreage amounts where the economic return is not great enough to pay for the investment in pipe.

G. Over-watering is a potential problem. A concern raised by the water master of the Chalk Creek Irrigation system and shared by others is that because there are no longer any water turns, and the convenience of sprinkler irrigation, some producers may now apply too much water onto their croplands. Producers now have unlimited access to their water and can water for as long as they want at anytime which could result in the over application of water. In addition, producers need to make sure that the

recommended nozzle size is used for their crop type and soil. Many producers purchased used pipe and some have not checked or opted to purchase the correct nozzles.

### 3. Effects to local government

A. Conversion from flood to sprinkler irrigation dramatically reduced sewage infiltration. In past years the Coalville City sewage treatment plant has consistently observed large increases in the volume of water entering the plant that coincided with the onset of irrigation season beginning in May of each year. Prior to the implementation of the Chalk Creek Sprinkler Irrigation Project the treatment plant was processing between 450,000-500,000 gallons of sewage/day during the irrigation season. This was due to irrigation water leaking into an antiquated sewage collection system. Beginning in May of 2002 with the irrigation project online the volume of water entering the plant dropped to 200,000-225,000 gallons of sewage/day, a 50% reduction in the amount of water entering the plant from prior years. It should be noted that Coalville City also replaced much of the old sewage collection system to reduce infiltration at approximately the same time they were installing their secondary system. Dennis Gunn, Coalville City sewage treatment plant operator attributes the 50% reduction in inflow equally to both the new irrigation system and new collection system.



Photo 5. The Coalville City Sewage treatment facility has benefited from dramatic reductions in irrigation infiltration, resulting in less cost and no longer overwhelming the system.

B. Secondary water is available to Coalville City residents. Coalville City had expressed interest in the Chalk Creek Sprinkler Irrigation Project from its outset because of its limited sources of water. Prior to the completion of the project many city residents have only had culinary water to water lawns and gardens. In drought years the city has had to place water restrictions on residents because of a shortage of drinking water. With completion of the project secondary water is now available to residents and it has reduced the demand on Coalville's culinary system.



Photo 6. Coalville City's new secondary water storage reservoir (left) provides additional storage capacity for the city's secondary water needs.

C. The New system resulted in an increase in Coalville City resident's water fees. In order to pay for the new system Coalville residents-base water bill went from \$10.00/month in January 2001 to \$28.00/month in Feb. 2001. This fee is assessed all Coalville City residents. There is a one-time hookup fee of \$500.00 charged to all that want to hook up to the secondary system. This fee provides a 1" connection for the property owner.

#### 4. Effects to the environment

A. Sprinkler irrigation has eliminated return flows to Chalk Creek. Eliminating return flows to Chalk Creek was one of the primary water quality improvement objectives. Because water is now being applied through a sprinkler system, tail-water no longer flows into the stream from surrounding croplands. Prior to the system a great deal of return flows entered the stream carrying sediment and nutrients washed from croplands and pastures back into Chalk Creek. This had obvious detrimental effects to water quality. In addition return flows saturated unstable stream banks causing further degradation and bank erosion.

B. Critically low in-stream flows during drought years. One aspect of the project that was not anticipated was the effect drought would have on in-stream flows from the diversion point downstream to Coalville. Chalk Creek has historically maintained viable in-stream flows throughout the summer, even in critically dry years. Historically in-stream flows were maintained by return flows from irrigation tail water or water that subbed back up along the stream course from deep percolation and springs. Water is now applied by sprinkler and encased in pipe; return flows are now eliminated below the diversion. For a period of about two weeks during the summer of 2002 stream levels dropped to critically low levels in early July. Almost all water was diverted at the diversion to meet water demands. This left approximately 5 miles of the stream from the diversion to Coalville essentially dry except for isolated pools. This occurred at a critical time of year when fish are stressed due to warm water conditions and decreased levels of dissolved oxygen. Once water stored in an upstream reservoir was released by mid July, in-stream flows below the diversion returned to levels that would support fish. It should be noted that this problem of de-watering the stream

below the diversion would not occur in average years of precipitation because there would typically be excess water to move downstream past the diversion. During drought years there may be a critical window in July where demand for irrigation water may use all water supplied by Chalk Creek. This could result in the lower portions of Chalk Creek being de-watered until storage water is released.



Photo 7. During the months of July and early August flows in the stream can reach levels where most of the water coming down Chalk Creek is diverted for irrigation at the diversion shown above. Photos taken 8/18/03.

C. Loss of riparian vegetation species from ditch-banks. Irrigation ditches in lower Chalk Creek have been established for decades. Riparian vegetation such as large Cottonwoods, Hawthorns and other trees and shrubs have established significant distribution along the irrigation ditches. The tree-lined ditches provide significant wildlife habitat. The ditches have either been abandoned or filled in or no longer carry water. Because of the loss of water it is expected that there will be a significant decline in riparian vegetation along the ditches and a reduction in tree and shrub cover along the margins of these ditches.



Photo 8. Because irrigation water is no longer flowing in the ditches, it is expected there will be a significant decline and loss of trees and shrubs which have established themselves along irrigation ditches over the decades.

## 5. Conclusion

The Chalk Creek Pressurized Sprinkler Irrigation Project is producing the desired result of improving water quality in lower Chalk Creek.



Photo 9

Additional benefits of the system to agriculture and Coalville City have proven invaluable as prolonged drought continues to grip the area. Drought has also manifest unanticipated environmental effects on the stream below the diversion. However, at this point in time the outlook for improving water quality in Chalk Creek looks better than it did a decade ago, in part due to this project.

### **3.0 Best Management Practices Developed and/or Revised**

All Best Management Practices (BMPs) were installed according to the NRCS Field Office Technical Guide (FOTG). A summary table of the BMPs implemented in the Chalk Creek Project is included in the table below:

Chalk Creek BMPs	
Brush Management	12888 acres
Channel Vegetation	9432 linear feet
Clearing and Snagging	340 feet
Critical Area Planting	4 acres
Pond	6 each
Fence	166659 feet
Sprinkler Systems	1024 acres
Drip Irrigation Systems	17 acres
Irrigation Water Management	1041 acres
Use Exclusion	371 acres
Pasture and Hayland Management	206 acres
Stock water Pipeline	5585 feet
Prescribed Grazing	58218 acres
Abandoned Mined Land Reconstruction	38 acres
Rangeland Planting	2025 acres
Spring Developments	4 each
Streambank Protection	21561 feet
Channel Stabilization	20 structures
Riparian Forest Buffer	13 acres
Livestock Watering Facility	9 each

Table 3

**Brush management** implemented in the Chalk Creek watershed typically consisted of reducing the amount of Big Sagebrush cover to increase the herbaceous component of the community to reduce erosion and improve hydrologic function.

**Channel vegetation** implemented in Chalk Creek watershed typically consisted of planting dormant willow and cottonwood poles near the bank-full stream bank zone.

**Clearing and snagging** implemented in the Chalk Creek watershed typically consisted of removing debris such as old car bodies from the stream.

**Critical area planting** implemented in the Chalk Creek watershed typically consisted of seeding and dormant pole plantings in heavily impacted riparian areas.

**Ponds** implemented in the Chalk Creek watershed typically consisted of building ponds on tributary streams to serve as sediment traps and livestock water.

**Fences** implemented in the Chalk Creek watershed typically consisted of barbed wire or net wire fences to facilitate grazing management or use exclusion on uplands and riparian areas.

**Sprinkler systems** implemented in the Chalk Creek watershed typically consisted of converting old flood irrigation systems adjacent to the stream to sprinkler irrigation to eliminate return flow into the stream, thereby reducing the amount of pollutants reaching the stream and bank erosion in these fields.

**Drip irrigation systems** implemented in the Chalk Creek watershed typically consisted of systems for establishing woody vegetation near the stream.

**Irrigation water management** implemented in the Chalk Creek watershed typically consisted of proper irrigation water use under sprinkler irrigation systems to ensure no irrigation surface runoff from the fields enter the stream.

**Use exclusion** implemented in the Chalk Creek watershed typically consisted of grazing exclusion on sensitive areas such as riparian areas to facilitate the recovery of riparian vegetation.

**Pasture and hayland management** implemented in the Chalk Creek watershed typically consisted of managing irrigated pastures and hayland to ensure adequate cover is maintained for erosion protection and hydrologic function.

**Stock water pipelines** implemented in the Chalk Creek watershed typically consisted of small diameter pipes to distribute drinking water for livestock to improve livestock distribution and facilitate reduced grazing use of riparian areas.

**Prescribed grazing** implemented in the Chalk Creek watershed typically consisted of altering the time, timing, and amount of grazing use on riparian areas and uplands to favor woody riparian vegetation and ensure adequate cover for erosion protection and hydrologic function.

**Abandoned mine land reconstruction** implemented in the Chalk Creek watershed consisted of reclaiming two abandoned coal mine sites thereby reducing the amount of sediment moving into Chalk Creek.

**Rangeland planting** implemented in the Chalk Creek watershed typically consisted of planting perennial grasses and forbs on rangeland to increase the herbaceous component of the community to reduce erosion and improve hydrologic function.

**Spring developments** implemented in the Chalk Creek watershed typically consisted of creating new livestock water sources to distribute drinking water for livestock to improve livestock distribution and facilitate reduced grazing use of riparian areas.

**Streambank protection** implemented in the Chalk Creek watershed typically consisted of installing rock barbs, conifer revetment, and bioengineering to reduce the amount of streambank erosion contributing sediment to Chalk Creek. See the example project case study included in this section.

**Channel stabilization** implemented in the Chalk Creek watershed typically consisted of vortex rock weir structures placed in the channel to prevent stream downcutting, thereby retaining floodplain function. See the example project case study included in this section.

**Riparian forest buffers** implemented in the Chalk Creek watershed typically consisted of planting woody riparian vegetation throughout the entire riparian area.

**Livestock watering facilities** implemented in the Chalk Creek watershed typically consisted of water troughs to distribute drinking water for livestock to improve livestock distribution and facilitate reduced grazing use of riparian areas.

### **3.1 Case Study BMP Example**

One landowner's project was selected for a case study to examine the effectiveness of the project. In this example, the landowner had recently acquired the property and was concerned about the amount of irrigated pastureland adjacent to Chalk Creek he was losing annually to bank erosion. In one instance the stream channel encroached approximately 30 feet into the pasture during a single snowmelt runoff event (see treatment section #4 on the map). Resource inventory revealed that past practices had resulted in many of the banks being devoid of woody riparian vegetation. Also, there were some apparent 'nick points' in the channel where active down-cutting was occurring annually. Evidence of past channel dredging was apparent on a few reaches. At one location, a new bridge constricted the flow in the channel.

#### **Design**

In 1995 the NRCS designed a stream bank protection for this landowner. This project involved installing rock rip-rap barbs, juniper revetment, willow plantings and low rock/vortex grade control structures. The project was job class VI due to drainage area.

The project involved stabilizing a 3,840 foot reach of Chalk Creek. Rock barbs were designed at places where active bank erosion was occurring. Willow plantings and juniper revetments were placed between rock barbs. These structures were needed to prevent bank erosion. On three of the treatment areas berms were constructed to function as new stream banks, and they were protected with rock barbs, juniper revetments, and willow plantings. The borrow pits for the berm construction were adjacent to the stream and function as ponds, not on the floodplain side of the stream but the opposite terrace (outside of the curve). On remaining areas existing vegetation was maintained.

The Chalk Creek drainage at this location is approximately 156 square miles. The 25 yr 24 hr storm flow is approximately 1450 cfs. Design bank-full flow is approximately 405 cfs. Design bank-full width was 35 feet. This watershed typically has one annual channel forming flow during snowmelt runoff.

The project is designed in accordance with practice standards 580 stream bank protection, 584 channel stabilization and 322 channel vegetation in the NRCS FOTG.

The slope of the creek, channel width, alignment and cross section were determined by field surveys. Utah Engineering Technical Note #7 was used to size and field locate sites for the rock barbs. Rock was sized using criteria in Far West Design Standards, rock gradation was selected based on criteria d100 is 2 to 3 times the minimum d50 rock size. The streambed materials at this site are a mixture of cobble, gravel and sand. The stream bank materials are a mixture of loam, sand and gravels.

The low rock/vortex grade structures were located in channel crossovers where active down-cutting was occurring. Seven structures were located based upon a field evaluation and

an analysis of the survey. Typical criteria is to limit the drop per structure to 1 foot. The rock size was evaluated using criteria in EFM chapter 16 and allowing for debris and an impact factor.

### Project Costs

The total cost for the example project described was \$41,934. A total of 1,484 feet of stream was actually treated within the 3,840 foot reach on this property. This amounts to a cost of \$28 per linear foot for the treated sections of stream. Cost data taken from averages of the projects in the Chalk Creek Watershed show that a basic bank protection project as shown in the typical reach layout (rock barbs, conifer revetment, and willow pole plantings) costs about \$18 per linear foot. This example project included numerous additions to the typical layout such as vortex rock weirs, constructed streambanks, and floodplain grading which resulted in the higher costs. It was difficult to separate the costs of some of the different components of this project because costs were combined on many of the invoices, but an approximation of the component costs is found in the following table.

Chalk Creek Example Project Costs	
Practice	Cost per unit
Vortex Rock Weirs	\$2000 each
Rock Barbs	\$500 each
Constructed Streambank (Berm)	\$11 per linear foot
Willow Plantings, dormant pole 2 row 3' spacing in each row	\$3 per linear foot
Conifer Revetment	\$4 per linear foot
Rock Rip-Rap	\$50 per linear foot

Table 4

Figure 2. Chalk Creek Example Project Design Data

Rock Gradation was determined using Utah  
Eng. Tech Note #7

$$\begin{aligned} D_{100} &= \max 36'', D_{75} = \min 12'' \\ D_{100} &= 2 \times D_{50} = 24'' \text{ to } 3 \times D_{50} = 36'' \\ D_{75} &= 1.5 \times D_{50} = 18'' \text{ to } 2.5 \times D_{50} = 30'' \\ D_{50} &= 1 \times D_{50} = 12'' \text{ to } 1.75 \times D_{50} = 21'' \\ D_{25} &= .5 \times D_{50} = 6'' \text{ to } 1.15 \times D_{50} = 14'' \end{aligned}$$

% Passing

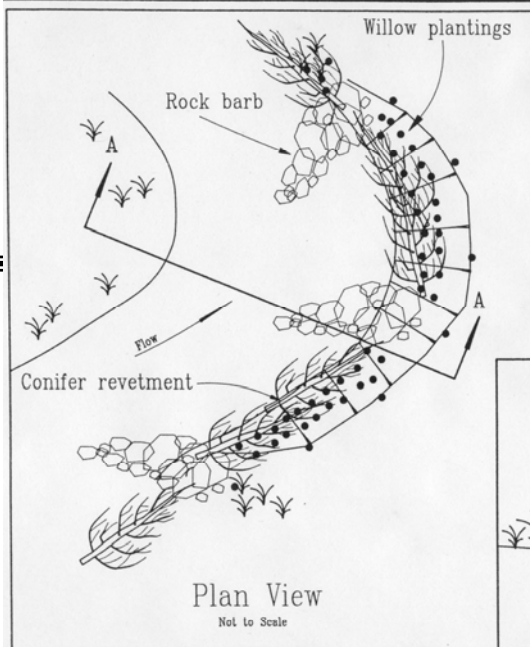
100	36''
100-75	24''
75-50	18''
50-25	12''
25-0	6''

From the field survey:

Channel Slope: 0.01 ft/ft

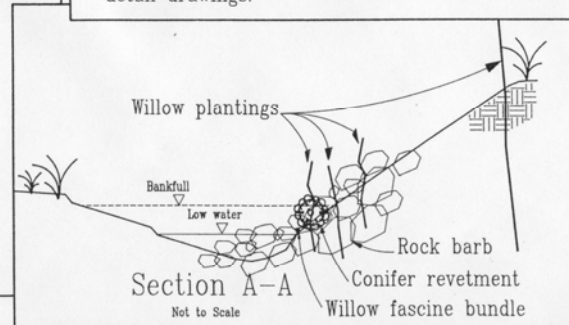
Bankful Width: minimum 45', maximum  
85'

Bankful Depth: minimum 2.2', maximum



Notes:

1. The entire streambank length between the barbs should be protected with conifer revegetment.
2. Large tree type willows should be installed prior to the establishment of the 2:1 slope.
3. Willow pole plantings should be installed just inside and above the conifer revegetments.
4. Willow fascine bundles should be installed on the channel side but not underneath the conifer revegetments.
5. See the rock barb, conifer revegetment, dormant willow planting, and fascine bundle detail drawings.



Typical Treatment Reach Detail

Rock size was calculated using the  
Far West  
Design Standards 6-13b:

$$D_{75} = \frac{3.5 \text{ WDS}}{\text{CK}}$$

$$W = \text{Specific Weight of Water} = 62.4$$

$$D = \text{Bankful Depth} = 3.4 \text{ ft}$$

$$S = \text{Channel Slope} = 0.01 \text{ ft/ft}$$

$$K = 0.72 \text{ for } 2:1 \text{ slope} = 0.72$$

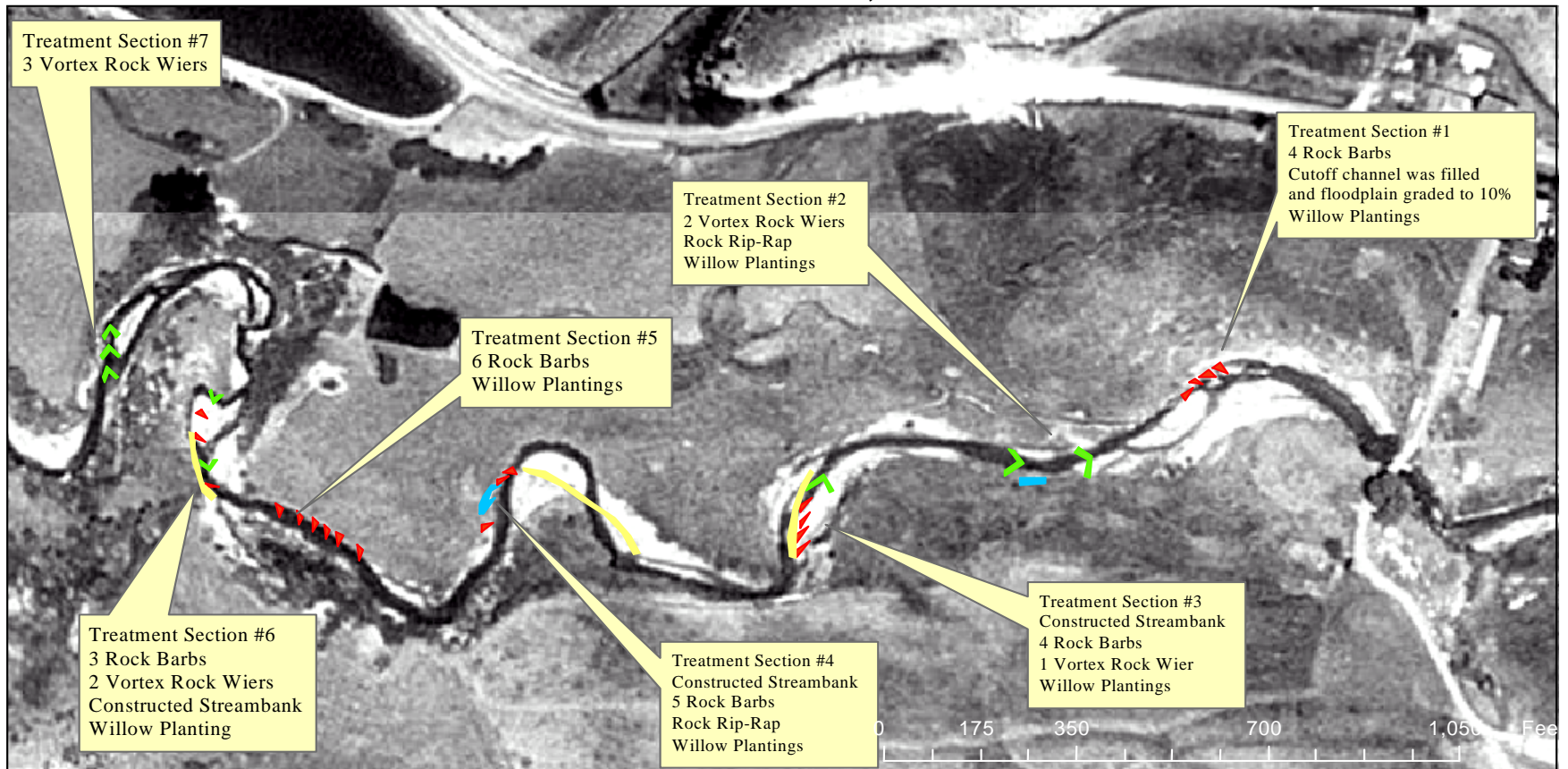
$$C = \text{Radius of Curvature/width} = 0.6$$

All of the rock barb installations followed the typical reach detail shown above with the attendant conifer revegetment and willow plantings. Willow planting techniques included pole plantings as shown on all areas, with willow brush blankets and willow fascines in selected areas (see The Practical Streambank Bioengineering Guide, NRCS 1998)

The benchmark condition included livestock access to the stream from the adjacent irrigated pastures. The conservation plan included corridor fencing to facilitate livestock exclusion to the stream during the establishment and recovery of the woody riparian vegetation. Prescribed grazing is planned in the riparian area following the recovery period for an early spring use only to favor the woody riparian vegetation.

## Chalk Creek Example Project

### Pre-treatment view, 1989



Treatment section #1 - the actively eroding bank was protected with a combination of rock barbs and willow plantings. A braided channel condition apparent in the photo was corrected by filling the cutoff channel and grading the floodplain to 10%.

Treatment section #2 - vortex rock wiers were installed to prevent downcutting following the installation of a bridge and the resulting constriction of the floodplain (see 2001 photo). A small section of rock rip-rap was installed on adjacent to a vulnerable bridge abutment structure.

Treatment section #3 - an overwidened and braided channel condition was corrected by installing a berm, or constructed streambank. This structure was protected by rock barbs, and a vortex wier was installed to prevent downcutting.

Treatment section #4 - an oversize meander condition was corrected by installing a berm, or constructed streambank. Actively eroding banks protected with rock barbs, and later rock rip-rap was installed between two of the barbs (see 2001 photo).

Treatment section #5 - an actively eroding streambank was protected with rock barbs.

Treatment section #6 - a berm was constructed at a site on the streambank that was at risk for cutting off a very large meander shown in the photo. In 1995, a large runoff event began cutting a new channel that threatened to cut off this large meander. The eroding streambanks were protected with rock barbs, and a widened and braided channel was corrected by grading the floodplain to 10%. 2 vortex rock wiers were installed to stop an active nick point from further downcutting.

Treatment section #7 - active nick points were prevented from further downcutting and upstream movement with 3 vortex rock wiers.

## Legend

practices

- Rock Barbs
- Vortex Rock Wiers
- Constructed Streambank
- Rip Rap

Figure 3

## Chalk Creek Example Project Post-treatment view, 2001



Treatment section #1 - The rock barbs were successful in stopping the active bank erosion, the willow plantings suffered from high mortality.

Treatment section #2 - The vortex wiers were successful in preventing downcutting of the stream. The upstream one was buried with a pulse of bedload and is no longer visible, however the braided channel condition did not return and the current channel is closer to the appropriate width to depth ratio. The willow plantings were unsuccessful here.

Treatment section #3 - All structures were successful and remain intact and functioning, willow plantings were also successful. The braided condition of the channel did not return and the current channel is closer to the appropriate width to depth ratio.

Treatment section #4 - The constructed streambank at this site remains intact, however the channel took an unexpected move in the opposite direction (see photo). This resulted in a very small radius of curvature, and active erosion began between two of the barbs. This was corrected by installing rock rip-rap between these barbs. The willow plantings were successful. The borrow pit where the material was taken to build the berm is now functioning as a pond (see photo).

Treatment section #5 - The rock barbs and willow plantings were successful.

Treatment section #6 - All of the structures and plantings were successful at this site. The braided condition did not return and the current has an appropriate width to depth ratio.

Treatment section #7 - All 3 of these wiers that were installed have been completely covered by a pulse of bedload and are no longer visible. The current channel has no apparent nick points and an appropriate width to depth ratio.

Legend	
	Rock Barbs
	Vortex Rock Wiers
	Constructed Streambank
	Rip Rap
	Existing Fence
	Planned Fence

Figure 4

## Project Results

The landowner is pleased with the results of this project. Annual spring runoff no longer erodes large sections of streambank, and the area has a more pleasing look due to the increased riparian vegetation and fewer raw banks. The eminent threat of the stream



changing course and cutting off a large meander at treatment section #6 has been alleviated. As discussed on the map view pages of this report, a few of the practices installed were not successful. Most notable was the

failure of the barbs to stop bank erosion in treatment section #4. We

expected the stream to follow the contour of the installed berm, but it started to curve away



### Photo 10.

*Treatment section #4 in 1995 prior to treatment, 1996 immediately following treatment, and in 1998. Bank erosion has ceased and woody riparian vegetation is recovering. Willow planting techniques here included dormant pole plantings and willow facines. Note the function of the rock barbs as the current is turned away from the bank downstream of each barb.*



from the berm in subsequent years (see map view). This caused a very tight radius of curvature on the bend where the erosion occurred between the barbs. A more careful analysis of the oversized meander and design of the placement of the berm may have prevented this.

A few of the willow plantings were not successful for various reasons, including grazing (not getting the corridor fences built quickly enough). Also, there is some speculation that the willow brush mattress failed due to planting in the fall rather than the spring. However, the pole plantings and facines that were installed in the fall were all successful.



The water quality impairments in Chalk Creek were sediment and phosphorus. Long term water quality monitoring conducted by the Utah Department of Environmental Quality shows upon analysis of the 1997 data that measurable reductions in phosphorus and sediment loads have occurred in Chalk Creek since the beginning

**Photo 11.**

*Treatment section #3 in 1995 prior to treatment, 1996 immediately following treatment, and in 1998. Bank erosion has ceased and woody riparian vegetation is recovering. The conifer revetment shows well in these photos, and by 1998 it has accumulated silt and vegetation has established on top of these revetments. The conifer revetments were necessary to provide protection in addition to the rock barbs for the excavated material used to construct the new streambank. Note the improved width to depth ratio of the channel and removal of the braided condition.*



of the project implementation in 1993. One explanation for this reduction is the implementation of many projects like the one described in this example that have occurred on Chalk Creek since the beginning of the project. Monitoring has continued and we are hopeful that future analysis of additional data will show a continued improvement.

### **3.2 BMP Effectiveness – Sediment Yield from Upland Sources**

Background: This report is an addendum to the Rangeland Sediment Yield Evaluation, Chalk Creek Hydrologic Unit, by Evenstad 1991. Data from that report was used to compare to post project conditions in the Chalk Creek watershed to evaluate the effectiveness of the project.

In 2003 it was determined necessary by the Utah Water Quality Division that an evaluation of the effectiveness of the project be done to fulfill reporting requirements to the EPA. The NRCS agreed to do this evaluation to assist the state with the project.

#### **Participants:**

Shane Green, Area 1 Range Conservationist, USDA NRCS, Coalville, Utah

Norm Evenstad, District Conservationist, USDA NRCS, Murray, Utah

Procedure Used: The same procedure that was used in the 1991 report was used in this report. That is the procedure outlined in “The Pacific Southwest Inter-Agency Committee – Factors Affecting Sediment Yield in the Pacific Southwest”, or PSIAC. This procedure evaluates geology, soils, climate, runoff, topography, ground cover, land use, upland erosion, and channel erosion and sediment transport. The 2004 repeat of this procedure only reflected changes in the ground cover, land use, upland erosion, and channel erosion and sediment transport factors that resulted from the implementation of vegetation manipulation, structures, and management changes resulting from project implementation.

#### **“PSIAC Areas” – Observed Changes over 13 years**

The same 7 divisions or “areas” established in the 1991 report were used in this report. A table summarizing the changes that have taken place over time is attached. A discussion of the project implementation that has occurred on the various divisions and the resulting changes in the PSIAC factors is discussed below:

- 1)** Chalk Creek Basin Moderate to Steep Slopes) – In 1991 a sediment yield rate of 2.4 tons/acre was reported. Project implementation in this area included improved grazing management, small water impoundments and sagebrush management. This resulted in improved ratings for ground cover, land use, upland erosion and channel erosion and sediment transport for 2004. The 2004 sediment yield rate is estimated to be 1.9 tons per acre.
- 2)** Badlands – This area had no improvement from project implementation, therefore the sediment yield rate for 2004 is the same as it was in 1991, 10.73 tons per acre.
- 3)** Bottom Lands – In 1991 a sediment yield rate of 0.46 tons/acre was reported. Project implementation in this area included improved grazing management, improved riparian cover, and improved channel function. This resulted improved ratings for ground cover, land use, and channel erosion and sediment transport for 2004. The 2004 sediment yield rate is estimated to be 0.37 tons per acre. It should be noted that this report and analysis does not include sediment from bank erosion. Bank erosion in Chalk Creek is treated separately in another report.

- 4) Landslide/Gullied Areas - This area had no improvement from project implementation, therefore the sediment yield rate for 2004 is the same as it was in 1991, 4.9 tons per acre.
- 5) Valley Walls (Huff Creek and similar) - In 1991 a sediment yield rate of 2.91 tons/acre was reported. Project implementation in this area included improved grazing management, and improved ground cover. This resulted improved ratings for ground cover and land use for 2004. The 2004 sediment yield rate is estimated to be 2.48 tons per acre.
- 6) Juniper Slopes - In 1991 a sediment yield rate of 12.87 tons/acre was reported. Project implementation in this area included improved ground cover resulting from the reclamation of mined areas. This resulted improved ratings for ground cover, land use, and channel erosion and sediment transport for 2004. The 2004 sediment yield rate is estimated to be 11.8 tons per acre.
- 7) Mountain Areas - In 1991 a sediment yield rate of 0.7 tons/acre was reported. Project implementation in this area included improved grazing management, improved riparian cover, and improved channel function. This resulted in improved ratings for ground cover, land use, and channel erosion and sediment transport for 2004. The 2004 sediment yield rate is estimated to be 0.66 tons per acre.

Conclusions: There is a difference in the sediment yield from 1991 Future Without Project condition to the 2004 conditions. The total tons of sediment saved (not delivered) is 106,262. This represents a 28.5% decrease from the 1991 Future Without Project condition. This decrease should be apparent in the water quality monitoring data.

It should be stressed that this report covers only sediment delivery from upland erosion sources. It does not include sediment contributions from stream bank erosion.

The 1991 report gives some predictions about how much sediment delivery would be reduced under 3 different project implementation scenarios. These scenarios predicted sediment delivery reductions ranging from 150,563 tons to 94,878 tons. The Chalk Creek Coordinated Resource Management Plan (CRMP) sets a goal of a reduction of 130,000 tons per year. The 2004 conditions represent the accomplishment of 82% of the goal in the CRMP.

There are two areas of project implementation that if strengthened could further reduce the sediment delivery rates. They are 1) Gully plugs, sediment control basins, seeding and other practices could be implemented in the juniper areas and gullied areas, and 2) The sediment sources resulting from oil and gas drilling sites (pads, roads, pipelines) should be addressed. If these areas received some focused attention the rate of sediment delivery could be reduced further.

## **4.0 Monitoring Results**

### **4.1 TMDL effectiveness evaluations**

The TMDL for Chalk Creek, approved in 1997, lists sediment and phosphorus as the main pollutants, and establishes as endpoints a reduction of 130,000 tons of sediment on rangelands and 8,200 tons/year of sediment from stream channels and banks. A summary of the accomplishments can be found in Section 2.4.

Annual loads for TP and TSS were calculated using daily streamflow data from the USGS gaging station near Coalville and concentration levels collected from water samples. The results are plotted in Figure 5, along with annual discharge values. As expected, the graph shows an association between TP and TSS. It is important to note that the decrease seen in the annual loads of both TP and TSS beginning in 2000 corresponds to drought conditions in the watershed. It is likely that, due to the association of TP with TSS, the reduction in phosphorus loads is closely related to the decrease in sediment supply to the stream during the drought years rather than actual improvement due to the implementation of BMP's in the watershed. However, an examination of years in which discharge values are similar indicates some improvement not related to discharge. For example, comparing 1996 to 2005 (two years with similar discharge levels), there is a dramatic decrease in both TP and TSS loads. The decrease in TP from 10 metric tons to 3.7 (63% reduction) and TSS from 17008 to 4034 metric tons (76% reduction) indicates that the improvements may not be related to discharge levels. In this case, the BMPs put in place appear to be having an effect on the water quality of Chalk Creek.

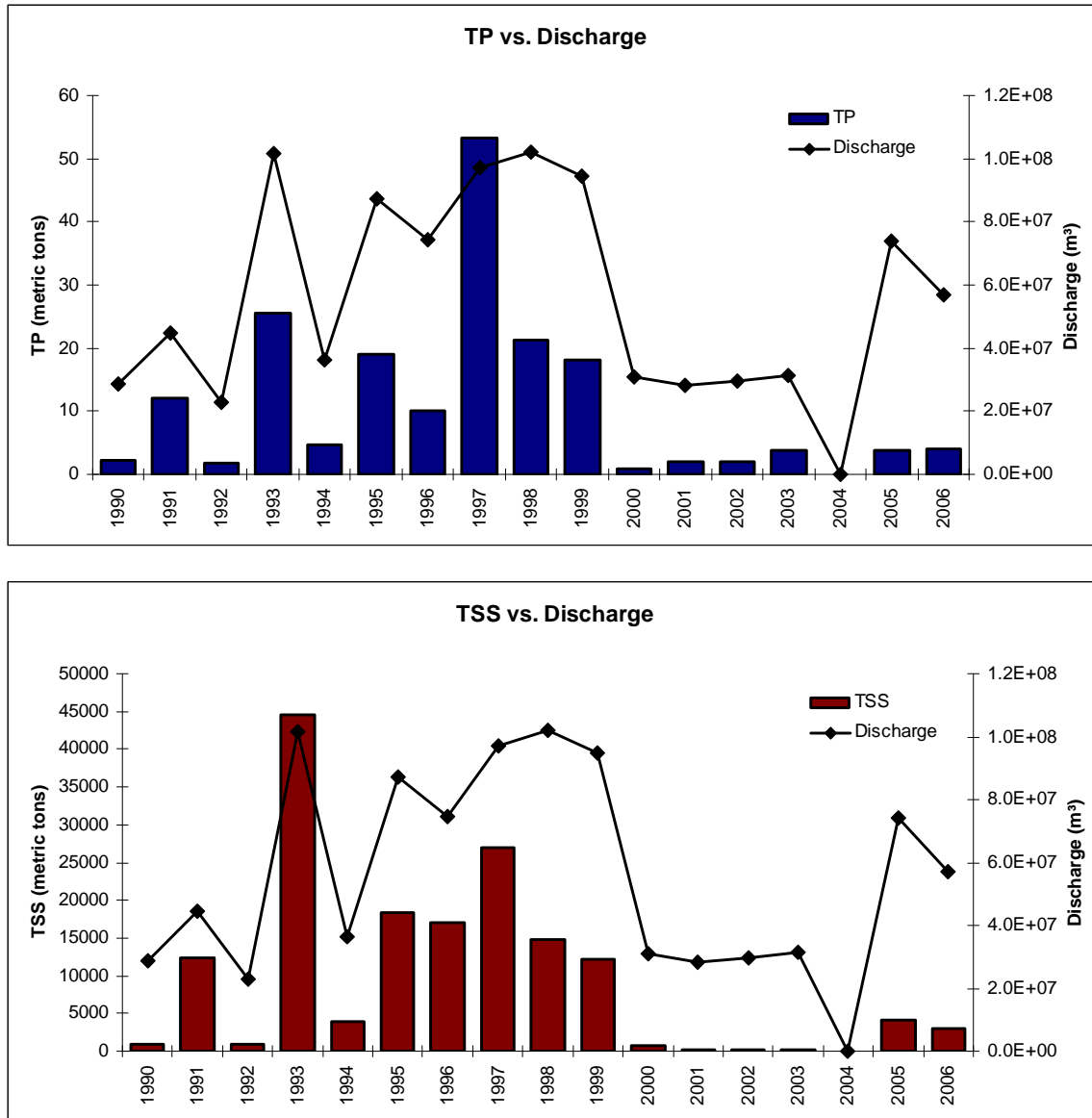


Figure 5. Annual loading and discharge data for Chalk Creek Site 4926350 at US189 crossing.

## 4.2 BMP Effectiveness Evaluations

Utah's Interagency Nonpoint Source Monitoring Workgroup was organized in 1992 to monitor BMP effectiveness in selected impaired watersheds. In addition to water quality, several measures of aquatic habitat, channel morphology and riparian stability and plant community characteristics were performed. Water quality data were collected approximately monthly for several years. Monitoring has shown declines in nutrients and suspended sediment and most of our site-specific surrogate sampling (e.g. riparian greenline and channel geomorphology) that is performed on actual project sites have also shown positive trends (see Section 4.3 below).

### 4.3 Surface Water Improvements

#### 4.3.1 Total Phosphorus and Total Suspended Sediments

The TMDL for Chalk Creek lists total phosphorus (TP) and total suspended sediments (TSS) as the major pollutants of concern. The pollution indicator level for TP concentration is 0.05 mg/L. Currently, an applicable pollution indicator level for TSS in the Chalk Creek drainage does not exist. The previous value of 35 mg/L was removed from the standards in 2004, as it was determined to only be applicable in the Bear River watershed. Figure 6 displays the percentage of samples exceeding the TP pollution indicator. Since 2000, the number of samples exceeding TP pollution indicator levels has been below 25% in 3 years. TP concentrations have not improved as dramatically, reaching non-supporting status 3 times since 2000; however, there is a downward trend in the percentage of samples exceeding the pollution indicator, indicating some improvement.

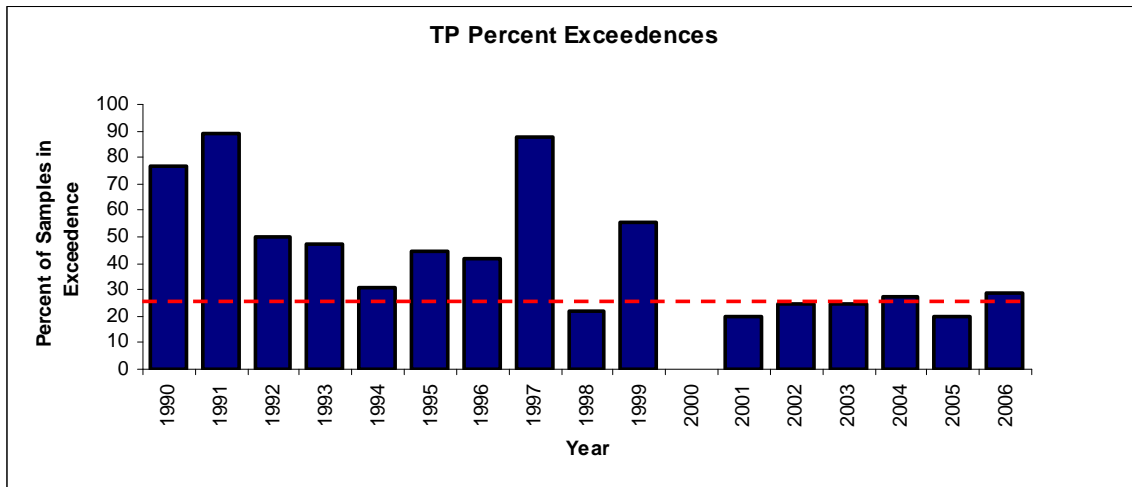


Figure 6. Percentage of TP samples exceeding the pollution indicator levels.

Figure 7 presents the annual mean concentration levels for TP during the time period 1990-2006. Mean concentrations have been below 0.05 mg/L 4 times since 2000. These dramatic reductions in mean concentrations are probably more drought-related than an indication of successful implementation of the BMPs in the watershed.

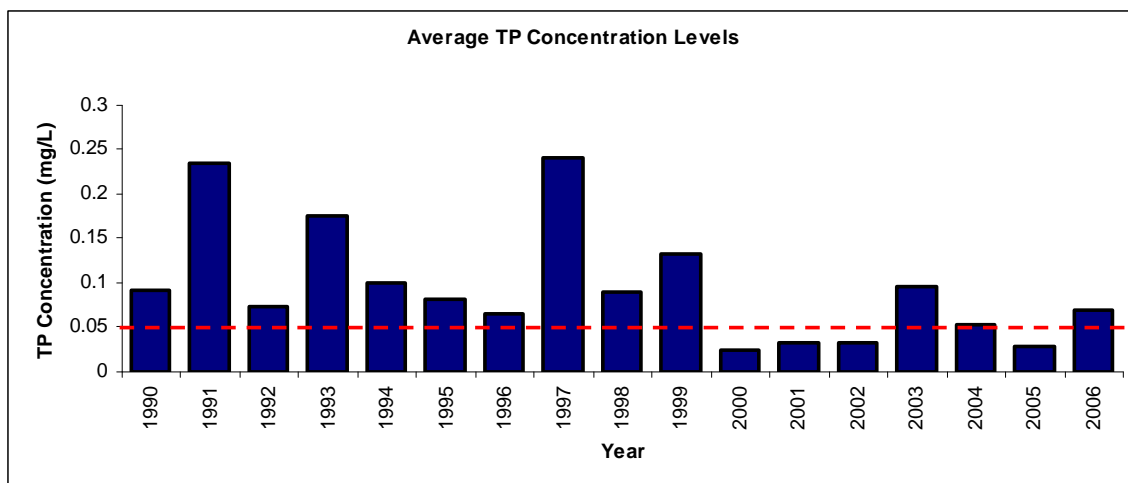


Figure 7. Mean annual concentrations for TP from 1990-2006.

#### 4.3.2 Macroinvertebrate Analysis

The macroinvertebrate population was sampled several times throughout the study period, in an effort to determine the health of the stream. Results from the samples show an abundance of sediment-tolerant species, and a scarcity of the “shredders” feeding group, indicative of a stream channel with excessive sediment, and a poor riparian habitat with relatively small amounts of organic material. One of the metrics used to describe the habitat is the Biotic Condition Index, which scores the conditions on a percentage basis. Nearly all scores fell within the 60-70 percentile, indicative of poor conditions. However, other metrics measuring biodiversity, biomass, and number of taxa indicate that the stream is in fair condition.

#### 4.3.3 Riparian Vegetation

Green-line transects were completed in 1995, 1996, 1997, and 1998. Three sites were chosen; two sites along Huff Creek (Ken Dawson and John Adkin sites), a tributary to Chalk Creek, and at a site on Chalk Creek near the town of Upton (Lyn Curtis site).

The Dawson site was treated by hauling grass hay onto the site, and then intensively grazed for a short time to maximize hoof action on the streambanks, covering the area with hay litter and “seeding” it with desirable plants. After the grazing, an electric fence was installed to exclude the cattle. However, frequent failure of the electric fence prevented the realization of the expected improvements. Tables 5 and 6 present the percent of green-line transects and green-line stability index for the Dawson site.

Percent of Green-Line Transects, Dawson Site

	1995	1996	1997
Wetland Communities	76	74	75
Other (Riprap, Bare Ground, etc.)	24	26	25

Table 5.

Green-Line Stability Index, Dawson Site

	1995	1996	1997
Numeric	5.50	6.38	6.44
Descriptive	Moderate	Moderate	Moderate

Table 6.

The Adkin (untreated) site was used as a control site, to monitor the results of continued moderate to heavy grazing, and compare them to a site with a BMP treated site. Tables 7 and 8 present the data gathered.

Percent of Green-Line Transects, Adkin Site

	1995	1996	1997
Wetland Communities	67	64	64
Other (Riprap, Bare Ground, etc.)	33	36	36

Table 7.

Green-Line Stability Index, Adkin Site

	1995	1996	1997
Numeric	4.62	4.73	4.75
Descriptive	Moderate	Moderate	Moderate

Table 8.

The Curtis site, located on Chalk Creek near the town of Upton, had emergency stream restoration work done in 1993 to prevent erosion during a high water period. In 1994, an oversized meander was restored, and approximately 3300 feet of streambank protection was installed, including rock “barbs” and willow and tree plantings. The area was also fenced off and protected from grazing. Data collected from the green-line transects is presented in Tables 9 and 10.

Percent of Green-Line Transects

	1994	1995	1996	1998
Wetland Communities	40	52	60	64
Other (Riprap, Bare Ground, etc.)	60	48	40	36

Table 9. Percent of Green-Line Transects for the Curtis (treated) site.

#### Green-Line Stability Index

	1994	1995	1996	1998
Numeric	4.30	3.97	4.62	5.85
Descriptive	Low	Low	Moderate	Moderate

Table 10. Green-Line Stability Index for the Curtis (treated) site.

While both sites along Huff Creek show little change in either percentage of wetland communities or stability, the Curtis site shows a steady improvement in both parameters. As this site is the only one of the three in which BMP's were properly implemented, it can be inferred that the improvement of the riparian vegetation is a result of the effectiveness of the work done.

#### *4.3.4 Stream Channel Geomorphology*

Seven transects of Chalk Creek at the Curtis site were measured in 1994, 1995 and 1998. The reach containing these cross-sections (G0-G6) was also surveyed along both banks to determine the bankfull location. The bankfull location, presented in plan view, is shown in Figure 8, along with the locations of the transects.

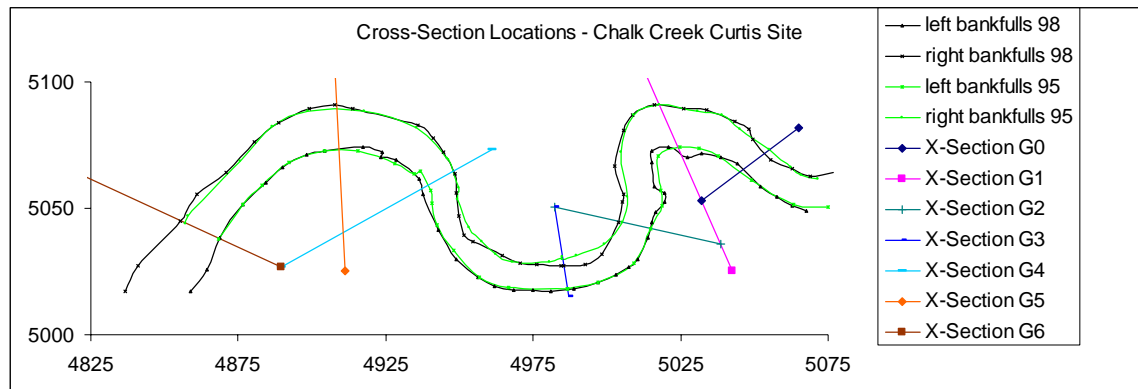


Figure 8. Plan view of Chalk Creek at the Curtis site, showing bankfull estimates and transect locations.

Figures 9 and 10 present transects G0-G6, with surveys taken in 1994, 1995 and 1998.

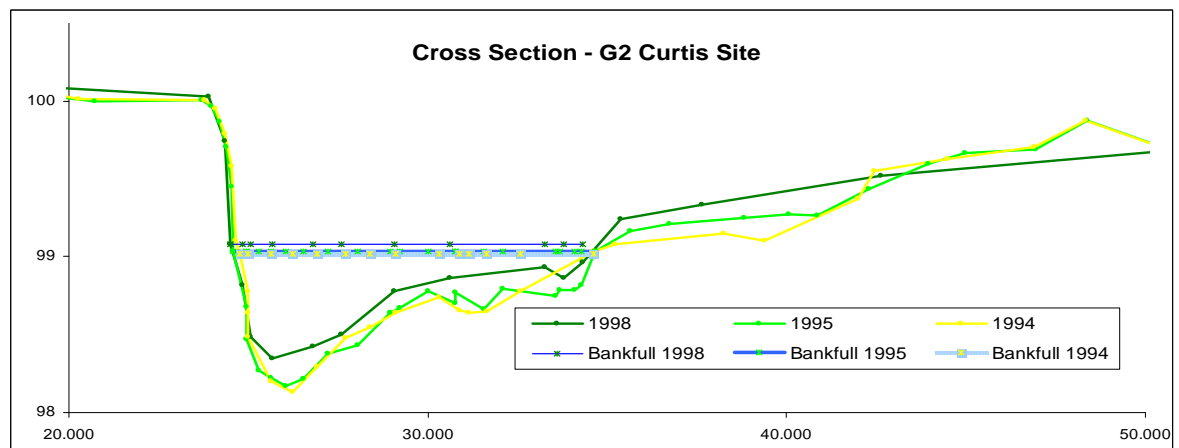
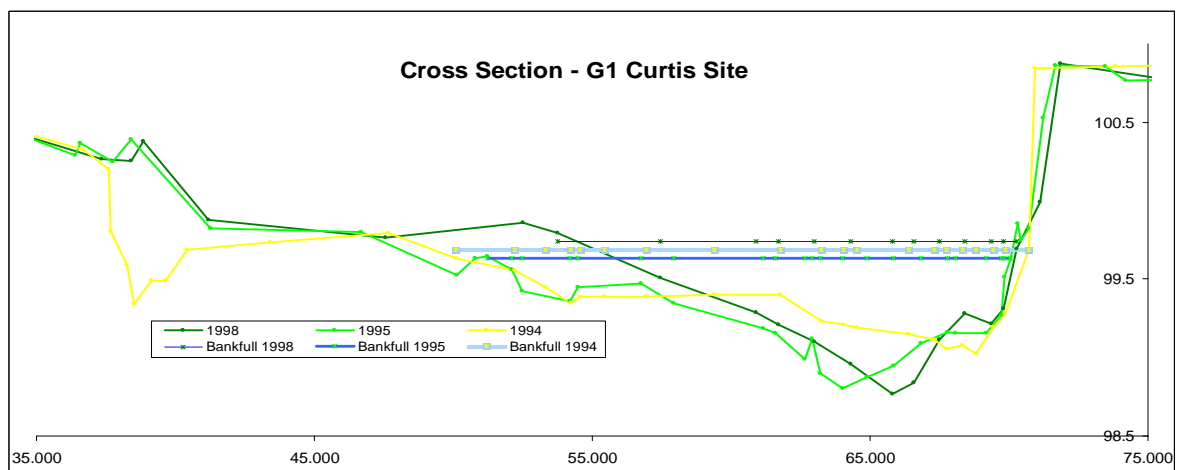
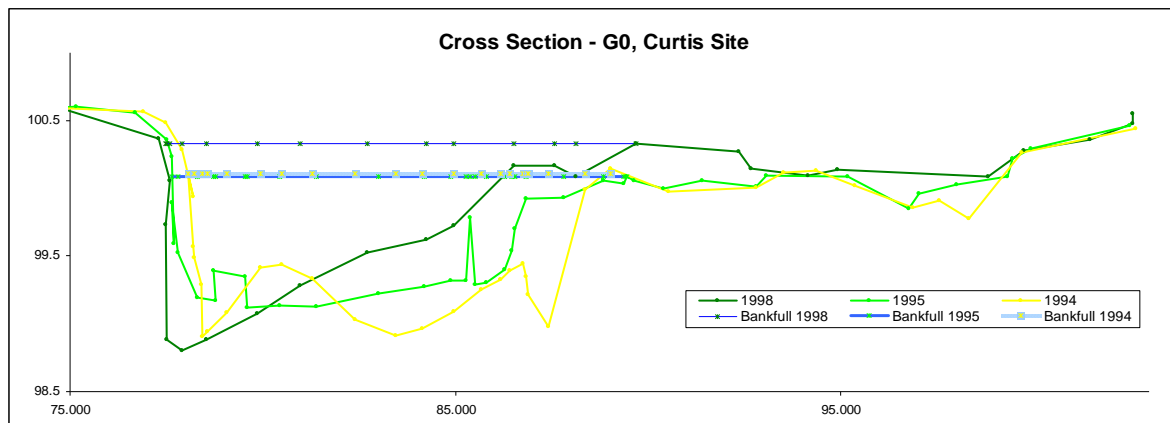


Figure 9. Transects G0-G2 on Chalk Creek at the Curtis Site.

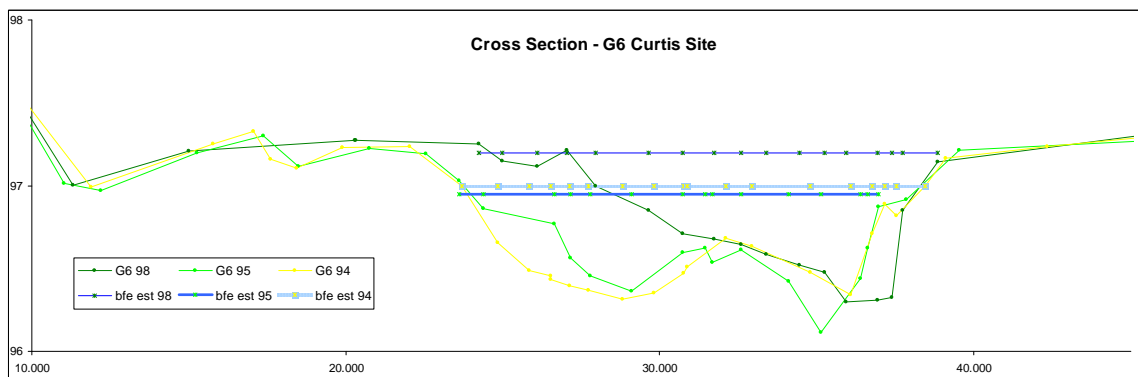
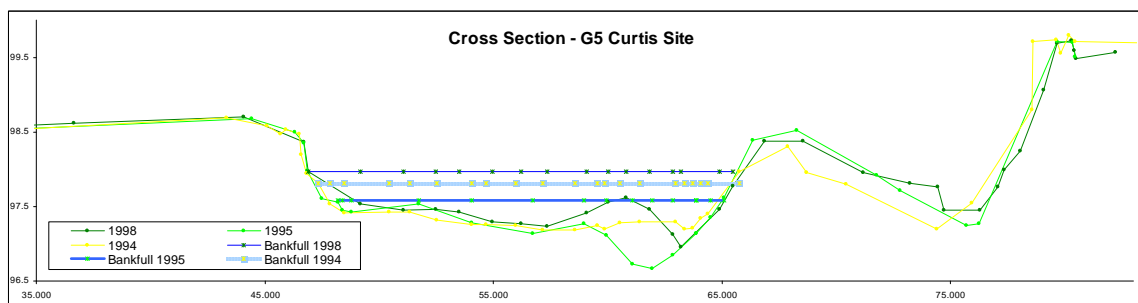
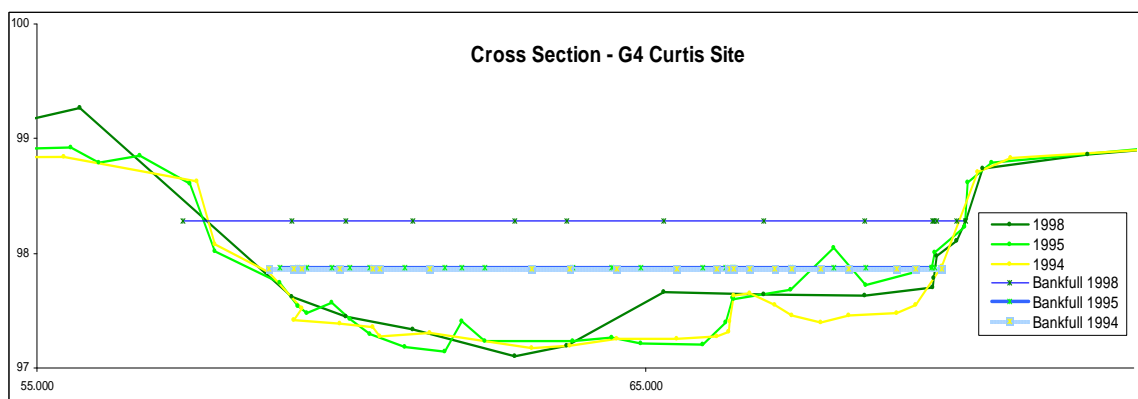
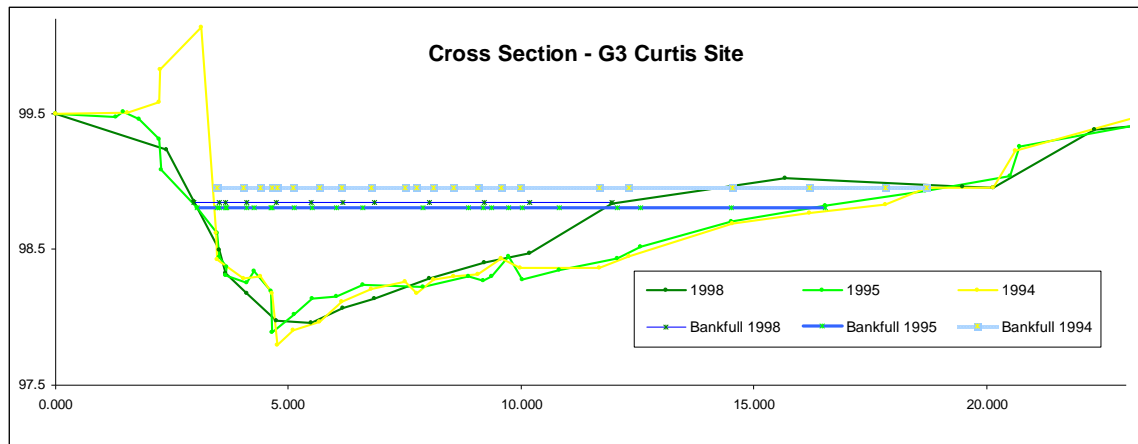


Figure 10. Transects G3-G6 on Chalk Creek at the Curtis Site.

An improving stream will generally narrow and deepen, and this can be seen in Transects G0, G1, G3 and G6. Table 11 displays the calculated width/depth ratios, which indicate some improvement, with ratios still fairly high. This data indicates that the stream is improving, but a continued narrowing and deepening is needed.

Transect	<u>Width: Depth ratio by year</u>		
	1994	1995	1998
G0	16.5	18.1	9.4
G1	140.5	44.7	30.2
G2	28.2	24.9	31.9
G3	49.8	38.6	16.4
G4	22.1	24.8	20.2
G5	38.6	41.6	39.7
G6	32.8	32.0	28.1

Table 11

#### **4.4 Quality Assurance Reporting**

All nonpoint source monitoring and assessment work has been completed under the quality control a Quality Assurance Project Plan (QAPP). This document was originally written in 1997 and was updated in 2004. It includes standard operating procedures for all nonpoint source monitoring tasks and cites the QAPP currently in force at the Utah State Health Lab for water quality analysis. In addition, where local sponsors (e.g. Utah Association of Conservation Districts or local offices of the NRSC), take responsibility to perform monitoring, each sponsor provides a project-specific QAPP to DEQ which is then forwarded to EPA for review and signature.

### **5.0 COORDINATION EFFORTS**

Because the Coordinated Resource Management Planning (CRMP) process was followed in the Chalk Creek project, coordination efforts with a multitude of agencies and entities were undertaken.

The CRMP process as undertaken in Chalk Creek consisted first of a Steering Committee, which was the decision making entity, and then various Technical Action Committees, who provided data and recommendations to the Steering Committee.

### **Chalk Creek Steering Committee**

- Chair, Summit Soil Conservation District
- Coalville City
- Summit County
- Irrigation Companies
- Landowners at large
- Hunting Groups
- Cooperative Extension Service
- Farm Service Agency
- Natural Resource and Conservation Service
- Utah Department of Agriculture

The Chalk Creek project was undertaken in an integrated, watershed wide approach. No one group or agency could have done this entire project alone. With the help of various organizations and agencies the water quality of Chalk Creek has been improved. The Steering Committee had decision-making authority for the project. Over 18 different government agencies and private entities provided assistance to the project through the Technical Action Committees.

## **5.1 Coordination from Other State Agencies**

*Summit Soil Conservation District* – Local project initiation, leadership and oversight.

*Utah Association of Conservation Districts* – Information and education aspects of the project, funds and match tracking

*Utah Department of Agriculture and Food* – Development of Project Implementation Plans, project video production, technical advice, EPA coordination

*Utah Department of Environmental Quality* – Coordination with EPA, Administering 319 grants, technical advice, water quality monitoring

*Utah Department of Water Rights* – Assisting in developing a blanket 404 permit process for the watershed, technical advice

*Utah Division of Water Resources* – Providing engineering assistance and low interest loans for the sprinkler system project

*Utah Division of Oil, Gas, and Mining* – Undertaking the mine reclamation projects

*Utah State University Extension* – Information and education aspects of the project, technical advice

*Utah Department of Forestry, Fire, and State Lands* – SIP program funding, technical advice

## **5.2 Other State Environmental Project Coordination**

Chalk Creek came under the umbrella of the TMDL program when the Chalk Creek CRMP was accepted by the EPA as a TMDL.

The Agricultural Resource Development Loan program was used in the watershed by landowners who needed to finance their portion in the cost sharing arrangement.

The Division of Water Resources Loan program was utilized by the new irrigation company to fund the sprinkler system project.

### **5.3 Federal Coordination**

*Environmental Protection Agency* – provided 319 grant for the project

*Natural Resources Conservation Service* – Project coordination, technical assistance to landowners, standards and specifications, individual project planning and design, project funding through conservation programs

*US Fish and Wildlife Service* – Funded projects with Partners for Wildlife program, technical advice, project design assistance, consultation on project

*US Army Corps of Engineers* – Consultation and technical advice on the project

*Farm Services Agency* – Project funding through conservation programs

### **5.4 USDA Programs**

Several USDA programs were utilized to fund projects in the Chalk Creek Watershed. They are:

Chalk Creek USDA Programs	
ACP	\$67,155
SIP	\$36,607
CCRP	\$5,000
WHIP	\$3,680
WQIP	\$310,672
SWCA	\$95,734

Agriculture Conservation Program (ACP) – A long standing conservation program administered by the FSA. It was discontinued in 1995. This program was used for implementing water quality plans.

Stewardship Incentive Program (SIP) – A program administered by Utah Forestry, Fire and State Lands for USDA. It was discontinued in 1996. This program was used to implement water quality plans on riparian areas.

Water Quality Incentive Program – A short lived program administered by the FSA. It was discontinued in 1996. This program was used for incentive payments for management practice changes on rangelands and riparian areas.

Soil and Water Conservation Assistance – A short lived program administered by the NRCS in 2001. It is now discontinued. This program was used to implement water quality plans.

Continuous Conservation Reserve Program (CCRP) – A program for riparian areas administered by FSA. This program was used to implement water quality plans on riparian areas.

Wildlife Habitat Incentive Program (WHIP) – A program under the Farm Bill to improve wildlife habitat. Administered by the NRCS. This program was used to implement water quality plans.

## **5.5 Accomplishments of Agency Coordination Meetings**

Agency coordination for the Chalk Creek project was undertaken through the Summit Soil Conservation District (SSCD) Board. Throughout the life of the project, the SSCD provided a forum for ongoing issues during project implementation. Monthly meetings were held where Chalk Creek watershed business was accomplished. Some examples are tour arrangements, 404 permit agreements with state agencies, individual project review and approval, and information about new programs for the watershed project rolled out. A special coordination group was formed to deal with the many issues that had to be dealt with concerning the sprinkler system project.

## **5.6 Resources/Coordination with Federal Land Management Agencies**

No coordination with federal land management agencies occurred because there is no federal land in the watershed.

## **5.7 Other Sources of Funds**

A variety of funding sources were used to accomplish the overall project, as shown in the following pie chart and table.

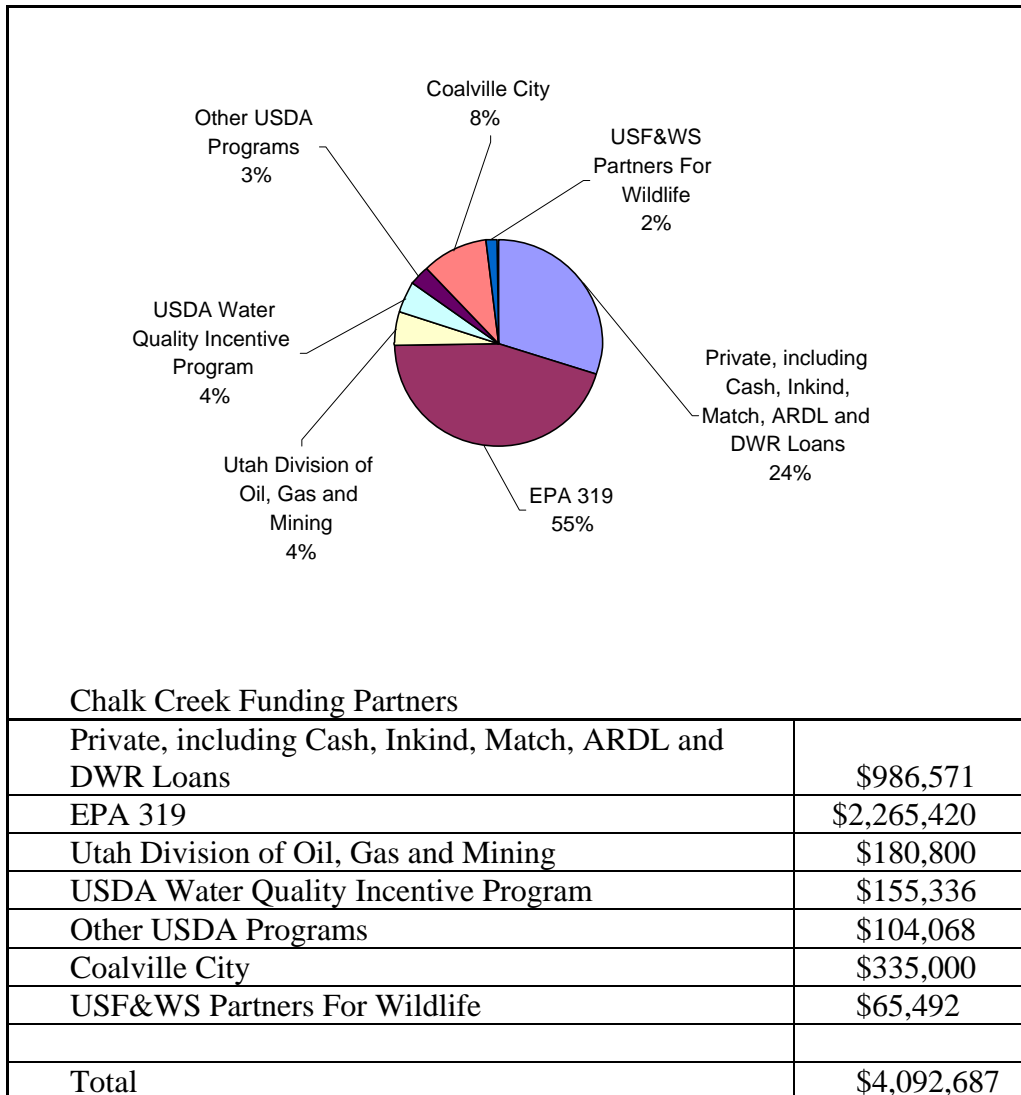


Figure 11

The funding from the Utah Division of Oil, Gas, and Mining was used for the reclamation of two abandoned coal mine sites. The funds from Coalville City were used to install the main-lines for the sprinkler system project. The funding from US Fish and Wildlife Service's Partners for Wildlife program were used to implement landowner's water quality plans.

## 6.0 Summary of Public Participation

Because the CRMP process was followed in developing the Chalk Creek Watershed Plan, public participation was openly encouraged and solicited. Some examples are:

- Early in the planning process, several public meetings were held to solicit input to the plan.
- SSCD monthly meetings where the project was coordinated and administered remained open to the public throughout the life of the project.
- Several meetings involving the nearly 140 shareholders of various irrigation companies were held to solicit input and answer questions about the process.

- The steering committee was made up of a majority of local leaders who represented their local constituents.
- Several tours were held during the projects implementation to showcase and demonstrate the effectiveness of project implementation

## **7.0 Aspects of the project that did not work well**

Please refer to sections 2.4, 3.1 and 3.2 of this report for a critical discussion on the effectiveness and shortfalls of BMPs implemented in the project.

Some of the milestones listed on the milestone table were not accomplished. They were:

Task 8 - Channel relocation away from land slide area. This task refers to a large eroding slope adjacent to Chalk Creek in the upper basin. This project could not be accomplished due to it's being located on one landowner's property that is fenced in with another landowner's property. Neither landowner was willing to do the project under the current situation.

Task 15 – Animal Waste Management. This task became unnecessary when the only dairy in the watershed went out of business. There are no feedlots in the watershed. However, there is at least one corral used for horses in the watershed that could be relocated to reduce the impacts to surface water.

Task 16 – Construct water bars and erosion control check ponds along access roads and trails. This task was included to address sediment sources in the watershed associated with oil and gas drilling operations. A cooperative relationship with the pipeline companies was never reached to address this problem.

Task 20 – Beaver control management plan. This task became unnecessary because the anticipated problems with beavers while trying to establish woody riparian vegetation never manifested.

## **8.0 FUTURE ACTIVITY RECOMMENDATIONS**

Ongoing assistance to landowners in the Chalk Creek watershed should be undertaken to fill in the gaps that exist where landowners were previously unwilling to participate or technical expertise was lacking. Specifically, the following items should be emphasized:

- Efforts should continue to work with the pipeline and drilling companies to reduce the amount of sediment sources from roads and drill pads in the watershed.
- Sediment sources from juniper ecological sites should be more fully addressed with the implementation of gully plugs, seeding, and other activities.
- Improving the irrigation systems on some of the small flood irrigation companies in the upper watershed should be pursued.
- Additional ponds in the upper watershed could be installed to serve as sediment traps.

These activities could be accomplished through the NRCS farm bill programs that are ongoing currently. The relationships developed between the NRCS, landowners, and other partners in the watershed will facilitate a successful maintenance and furthering of improvements achieved in the Chalk Creek Watershed project.

## 9.0 APPENDIX

ADDENDUM TO PREVIOUSLY APPROVED FINAL REPORT (prepared by UACD July 6, 2010): See table below showing landowners, BMP, I and E activities and cost accounting for FY-2002 NPS Section 319 funding grant totaling \$175,000 of 319 plus local match.

Chalk Creek Watershed Nonpoint Source Pollution Prevention			Contract Number 03-0308			
May 2, 2002 - Sept. 30, 2009		UACD JOB Number 552				
Name	BMPs	Invoice #	Date	NPS 319 Grant	Match	Total
<u>Cooperator Installing BMPs</u>						
Chalk Creek Narrows Irrigation Co.	Pipeline materials	3113	3/27/2003	\$21,606.52	\$14,404.34	\$36,010.86
Chad Wright	Irrigation System - Wheel Line	5005	7/30/2004	\$20,966.08	\$13,977.39	\$34,943.47
Tom Boyer	9,800' pipeline, 3 mini pivots, 1 concrete ditch box	5009	8/3/2004	\$59,617.00	\$39,744.66	\$99,361.66
Gary Boyer	Troughs and pipeline	5054	11/30/2004	\$1,161.16	\$774.11	\$1,935.27
T.E. Moore Ranch	Fence	5119	3/4/2005	\$4,117.35	\$2,744.90	\$6,862.25
Shirley McFarlane	Lay-down cross fence	6137	2/27/2006	\$13,899.15	\$9,266.10	\$23,165.25
Jean Potter Estate	Fence & Stream Stablization	6242	6/30/2006	\$6,499.80	\$4,333.20	\$10,833.00
Rick W. Potter	Pipeline, sprinkler, and generator	7154	1/19/2007	\$26,966.60	\$17,977.73	\$44,944.33
Tom Boyer	Big-gun sprinkler & stand, fittings, nozzles	8100	1/11/2008	\$3,390.00	\$2,260.00	\$5,650.00
Rick W. Potter	Instalation and electric pump	9077	11/24/2008	\$13,776.34	\$9,184.23	\$22,960.57
On-the -ground						
<u>Information and Education</u>						
Utah Association of Conservation Districts	Labor & Expenses	6117	1/19/2006	\$2,938.00	\$1,958.67	\$4,896.67
Utah Association of Conservation Districts	Labor & Expenses	6208	6/30/2006	\$62.00	\$41.33	\$103.33
<b>Total</b>				<b>\$175,000.00</b>	<b>\$116,666.66</b>	<b>\$291,666.66</b>

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