Clean Water Act

Section 319 Nonpoint Source Pollution Control Program

Watershed Project Final Report

Cub River, Cache County, Utah

By

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September 30, 2009

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

UDAF Contract # 01-1912, 02-1676, 03-0603 UACD Job # 506, 616, 521, 537, 548

EPA Grant #s: C9998187-99; C9998187-00; C9998187-01 and C9998187-02

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EXECUTIVE SUMMARY

Project Title:	Cub River		
Start Date:	June 1, 2000	**Completion Date:**	September 30, 2009
Funding year: Federal		**EPA 319 Funds:**	**EPA + 319 match:**
	FY 99	**$87,580.00**	**$145,967**
	Subcontract 00-1740	UACD job 506 $75,000.00	$125,000
	Subcontract 00-1740	UACD job 616 $4,000.00	$6,667
		USU water quality ext. (Nancy Mesner) $8,580.00	$14,300
	FY 00	**$80,400.00**	**$134,000**
	FY 01	**$100,000.00**	**$166,667**
	FY 02	**$70,700.00**	**$117,833**
		Total Budget:	**$564,467**
		Total EPA 319 Grant:	**$338,680**
		Total expenditures of EPA funds (to date):	**$329,682**
		Total 319 Match accrued:	**$219,788**
		Total expenditures:	**$549,470**
		Non-disbursed 319 Grant funds by contract number:	
		00-1740	$8,638.57
		01-1912	$5.50
		02-1676	$0
		03-0603	$353.94
		Total non-disbursed 319 Grant:	**$8,998**
		Total non-disbursed 319 Grant with 319 Match	**$14,997**

Summary Accomplishments

Watershed improvement projects in the Cub River region began in June 2000, and finished in September 2009. Work will continue on the Cub River on other contracts in the Middle Bear River Watershed. The Cub River Project received $330,100 in section 319 funds and obligated all but $8,998.01 of these funds to individual contracts.

The primary goals of projects along the Cub River have been to: reduce nutrient and sediment loading from animal feeding operations (AFOs) located directly on or adjacent to the river; improve upland/pastureland management to further reduce sediment and nutrient runoff; and stabilize the river's riparian corridor, which has been impacted by channelization and dredging. These goals have largely been accomplished through the implementation of the following Best Management Practices (BMPs):

- relocating animal feeding operations
- restricting access to streambanks with protective/exclusion fencing
- providing off-stream watering facilities for livestock and/or wildlife
- developing springs to fill off-stream watering troughs
- installing water conveyance pipeline
- re-vegetating critical riparian areas
- informing and educating the community about non-point source pollution and the importance of maintaining and improving water quality within the watershed

Most projects in the Cub River area have focused on improving storage and management of animal waste, as well as removing livestock from streambanks by installing livestock exclusion fence and developing off stream water sources with frost free troughs, pumping plants and pipeline. The installation of livestock exclusion fence has kept livestock away from waterways and reduced nutrient and sediment loading. Several thousand feet of cross fencing have been installed to initiate rotational grazing on fragile pasturelands. The installation of improved irrigation systems has also reduced runoff and soil erosion.

The primary informational and educational activities for the Cub River projects have been the distribution of brochures advertising the availability of financial assistance to local producers and participation in the Bear River Celebration. UACD staff has participated annually in the Bear River Celebration, which educates the public about water quality issues and often offers the opportunity to participate in a water quality improvement project. Volunteers at the Bear River Celebration have helped build a historically accurate livestock exclusion fence and repaired streambanks with riparian shrub plantings. In September of 2009 a field day was held to highlight the projects that had been implemented in the watershed. The tour took several landowners to various projects highlighting the benefits of each BMP.

1.0 INTRODUCTION

The Cub River Watershed is located in Cache County, Utah and Franklin County, Idaho. The Cub River is a tributary to the Bear River, which flows south from Idaho to Utah and drains into the Great Salt Lake. The Cub enters the Bear River southwest of the town of Richmond, UT. The watershed encompasses approximately 153,000 acres (USGS calculation of watershed, Whitehorse Associates estimates 142,700 acres due to the western portion of the watershed that has a network of ditches that may drain East to the Cub River or West to the Bear River), of which about 105,000 acres are in Idaho and the remainder in Utah. Land within the watershed is used primarily for livestock feed production, grazing and wildlife. The eastern third of the watershed falls within the Cache National Forest and the remainder of the land in the watershed is privately owned. Private lands are in both dry and irrigated cropland, pasture and rangeland. The majority of the agricultural land within the watershed is under irrigation and crops grown include alfalfa, small grains, corn and hay pasture. Approximately 80 animal feeding operations (AFOs) are located in the basin, with about half in each state. The population of the watershed is approximately 13,000, with most of the citizens residing in five towns: Preston and Franklin, Idaho and Richmond, Lewiston and Cove, Utah.

Average annual precipitation in the drainage ranges from 14-17 inches, with most of that falling as snow during the winter months. Mean annual air temperature is 45-47 degrees Fahrenheit (7-9 degrees Centigrade) with a frost-free season of 120-140 days. Mapped soils below the 5000-foot elevation level are formed in mixed lake sediment and alluvium derived mainly from limestone, sandstone and quartzite.

The Cub River watershed includes Cub River, Worm Creek, High Creek, City Creek, Cherry Creek and many springs and small tributaries. It is a major tributary to the Bear River. The River's mean flow at the Forest Service boundary was about 80 cfs over the period of record (1940-1952), with a 90th percentile flow of more than 200 cfs. At the Utah-Idaho Stateline, the mean flow over the period of record (1940-1952, 1955-1986) was 120 cfs and the 90th percentile flow was greater than 300 cfs.

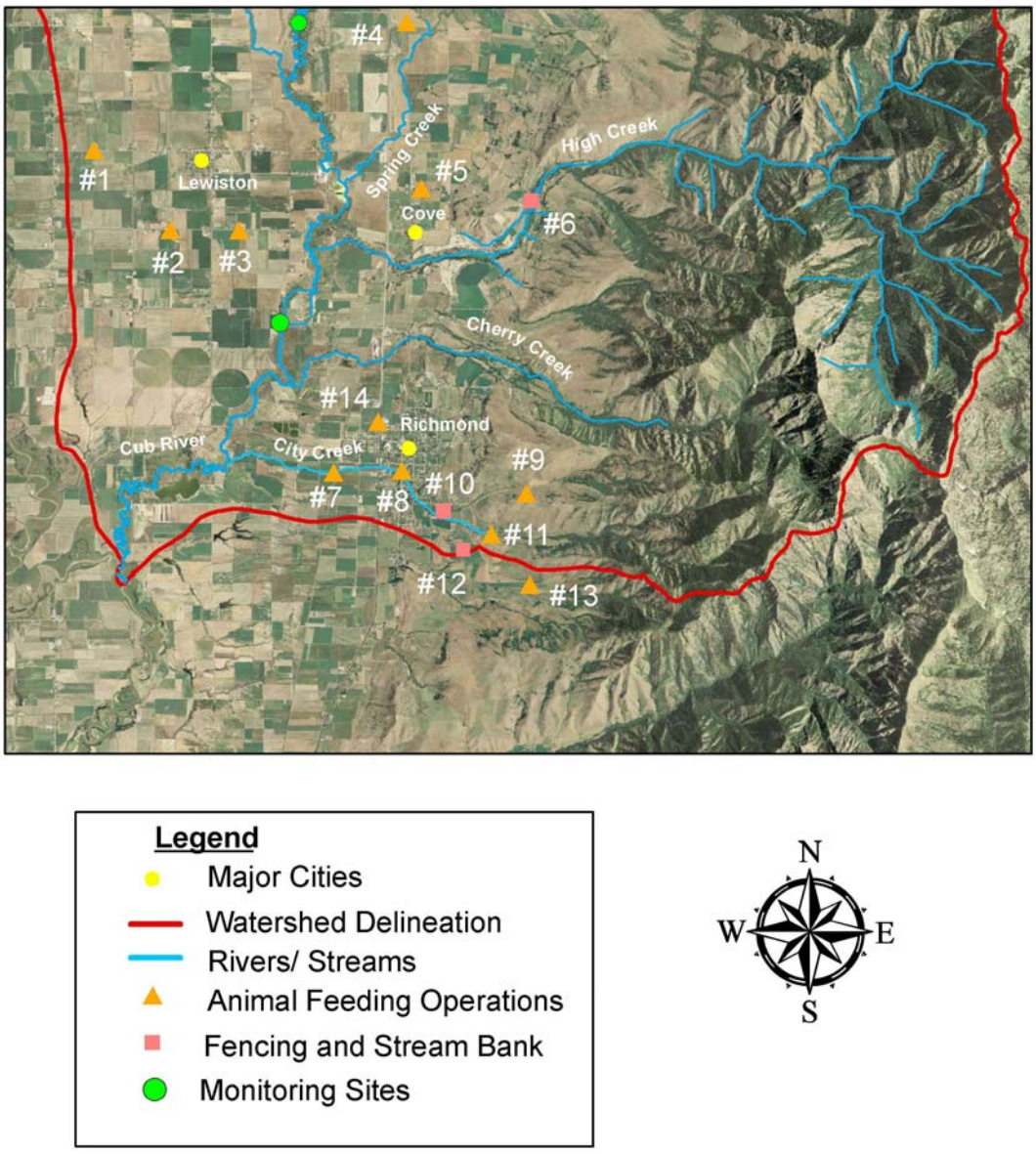
Using Rosgen's Stream Classification Method, the upper watershed consists of type A and B category streams. As the river exits the mountainous region the majority of the river would fit into a type C category with many segments falling into a type G category stream.

Table 1: Utah Beneficial Use Classification and Description

2B	Protected for boating, water skiing and similar uses excluding recreational bathing (swimming).
3A	Protected for cold water species of game fish and other cold water aquatic life, including the necessary aquatic organisms in their food chain.
4	Protected for agricultural uses including irrigation of crops and stock watering

1.1 Map: Cub River Watershed

Figure 1: Cub River Watershed with project sites



2.0 PROJECT GOALS, OBJECTIVES, AND TASKS

GOAL 1: Assist animal feeding operations in the Cub River area of the Bear River watershed to implement and demonstrate containment, proper application and utilization of animal manures using Best Management Practices.

Objective 1: Develop eighteen to nineteen animal waste systems to ensure total containment of animal manure and reduce pollutants entering the Cub River drainage.

> Tasks: Build concrete waste storage structures; install pumps and pipelines for manure transfer; improve waste management practices.

GOAL 2: Improve stability of the stream channel and enhance the riparian corridor to reduce sediment and nutrient loading to the river and its tributaries.

Objective 1: Install eighteen to nineteen projects that reduce sediment and nutrient loading to the river through improved function of the stream bank and riparian area.

> Tasks: Stabilize riverbanks with rock barbs and vegetation.

GOAL 3: Improve upland management practices to reduce sediment and nutrient runoff to the river and its tributaries.

Objective 1: Demonstrate a reduction in nonpoint pollution, sediment and nutrients, from improved upland/pastureland management.

> Tasks: identify around 12 river bank projects that can be corrected using livestock exclusion fence; install soil protection in high use areas; monitor projects

GOAL 4: Inform and educate the community concerning non-point source pollution and the importance of maintaining and improving water quality within the watershed.

Objective 1: Conduct two tours of project cooperators focusing on: 1) animal waste system designs and proper manure application; 2) functioning riparian areas, stable streambanks, and properly managed uplands/pasture lands.

> Tasks: Plan and conduct project tours.

Objective 2: Share general and technical information with producers and area stakeholders.

> Tasks: Prepare and publish news articles and other informational documents.

Goal 5: Provide administrative services to project sponsors.

Objective 1: Document matching contributions, track individual progress, coordinate team efforts, and generate reports and data in a timely manner.

> Tasks: Track match; prepare and file semiannual, annual and final reports.

2.1 Planned and Actual Milestones, Products, and Completion Dates

GOAL/OBJECTIVE/TASK	PLANNED OUTPUT/PRODUCT	PLANNED AMOUNT	ACTUAL OUTPUT	COMPLETION DATE
Goal 1: Objective 1:				
Task 1: Install a facility to store liquid and/or solid waste on a temporary basis	Concrete storage structure	10	10	06/03-09/09
Task 2: Construct waste separator to separate liquid and solid waste before entering storage pond	Waste separator	2	2	07/06
Task 3: Install overshute and box	Overshute and box	1	1	06/03
Task 4: Construct earthen pond to store liquid waste	Pond	1 (4900 yd^3)	1	09/09
Task 5:Install lining to reduce seepage in pond	Bentonite clay lining (or similar material)	35,525 ft^2	17,000 ft^2	12/06
Task 6: Install a pump to empty the manure storage facility	Manure transfer pump	6	4	05/03-09/09
Task 7: Install a pipeline to transfer liquid runoff away from clean water source	Manure transfer pipeline	1400 ft.	1059 ft.	06/03-09/09
Task 8: Install manure conveyance system	Pre-cast concrete box	1	1	12/06
Task 9: Install clean-out in pipeline to access pipeline for cleaning and emptying	Simple clean-out	2	2	06/03

Goal : Objective 1:				
Task 10: Place rock riprap on streambank for protection	Rock barbs	15	22	12/00-3/03
Task 11: Create or maintain an area of grass, trees and/or shrubs adjacent to water bodies	Riparian forest buffer	14.1 acres	14.1	12/07
Task 12: Establish woody plants for streambank protection	Tree establishment	1,000 ft.	1,000 ft.	12/00-3/03
Task 13: Install underground pipeline and appurtences to reduce erosion and seepage	Conveyance pipeline	20 ft.	20 ft.	12/07
Goal 3: Objective 1:				
Task 14: Construct fence for use as barrier to wildlife, livestock, or people	Fence	29,821 ft.	22,582 ft.	10/03-09/09
Task 15: Install corral fencing	Corral fence	100 ft.	100 ft.	10/05
Task 16: Install pipeline to convey water from supply source to points of use	Water conveyance pipeline	4,640 ft.	3,100 ft.	11/05
Task 17: Install a pumping facility to transfer water	Pumping plant	2	2	12/06
Task 19: Install drinking water facility for livestock and/or wildlife	Watering facility (trough)	10	10	11/04-09/05
Task 20: Establish forage species for grazing or mechanical harvest	Pasture and hay planting	42 ac.	38.5 ac.	5/06
Task 21: Build designated route or constructed travel way to be used by vehicles as necessary for management of operation	Gravel base access road	60.0 CY	60.0 cy	12/07

Task 22: Construct a channel across the slope with an embankment on the lower side to divert water from its natural flow	Berm/Diversion	1,130 ft.	670 ft.	06/03
Task 23: Install irrigation system for efficient distribution of water	12” alfalfa valve system	8.0 acres	0	n/a
Task 24: Install pipeline to improved irrigation system designed to reduce water loss, soil erosion, and salinity	Irrigation pipeline and all appurtences	5500 ft.	5500 ft.	11/04
Task 25: Install structure to control direction, rate and/or level of water in the system.	Water control structure	2	1	09/06
Task 26: Improve springs and seeps by excavating, cleaning, capping or providing collection and storage facilities	Spring development (installation, gravel, geotextile, springbox, appurtances)	2	2	11/04-07/06
GOAL 4: Objective 1				
Task 27: Plan and conduct project tours	A Field Day was conducted where several projects were visited with other landowners.	1	1	09/09
Task 28: Prepare and publish news articles, brochures, etc.	Individual brochure mailings to Cub River residents, Cache Conservation News articles	3	2	07/06-12/06
GOAL 5: Objective 1				
Task 29: Track match	Documented funding records	Completed	Completed	09/09
Task 30: Prepare and file reports	Semiannual, annual and final reports	Completed	Completed	09/09

2.2 Evaluation of Goal Achievement and Relationship to the State Non-Point Source (NPS) Management Plan

The State of Utah Nonpoint Source Management Plan stresses several elements necessary to achieve orderly and comprehensive planning. Private landowners, water right owners, public interest group, and local, state, and federal government agencies all play a role in the process. Coordinated Resource management Group has met monthly for a number of years looking at the management of natural resources and the management practices to improve them.

The North Cache Conservation District has played a key role in the leadership of locally-led conservation and directing local work group meetings. They have focused on providing direct communication between landowners and federal agencies. Considerations of resource concerns have been developed. A resource assessment was developed and a long-range plan implemented.

2.3 Supplemental Information

Figure 2: Concrete waste storage structure (Lewiston, Utah #1)

Figure 3: Protective fencing (Richmond, Utah #12)

Figure 4: Off stream watering facility (Richmond, Utah #10)

Figure 5: Protective fencing (Richmond Utah #10)

Figure 6: Pasture/feedlot near stream before (Richmond Utah #7)

Figure 7: Pasture near stream after (Richmond, Utah)

Figure 8: Solid and liquid bunkers. Previously Wash water and runoff would run into the Cub River. (Richmond Utah #14)

3.0 BEST MANAGEMENT PRACTICES DEVELOPED AND/OR REVISED

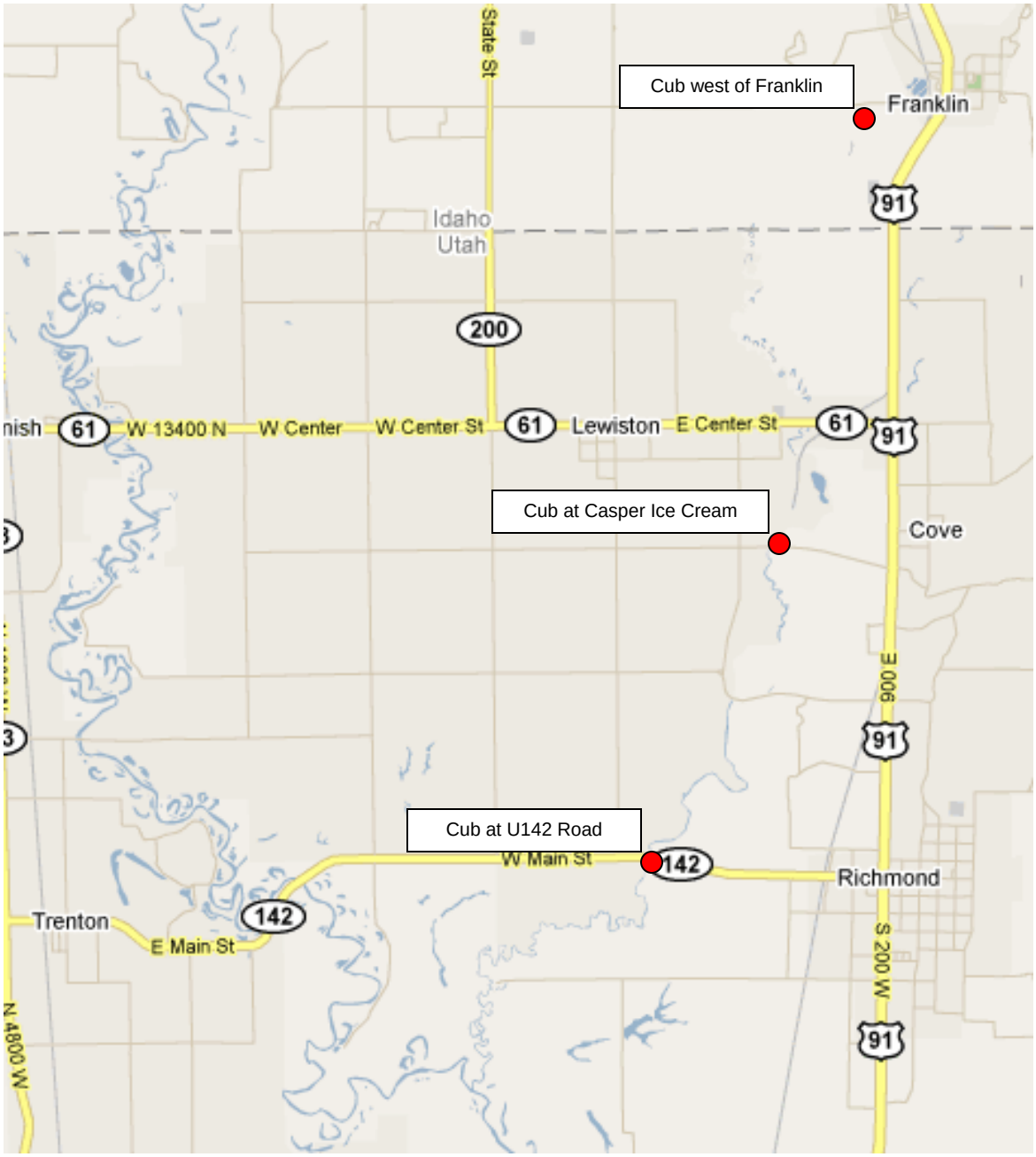
Projects in the Cub River Watershed were designed to demonstrate reduction in sediment and nutrient loading as well as stream bank stabilization and restoration. Best Management Practices used to achieve these goals include to date: livestock exclusion fencing; off-site stock watering; and filter strips.

The feed lots that were moved were located on or within 50 meters of the river. They have now been moved to a distance of 1000 meters or more, or where the slope of the feed lot does not enter into the river. The operations that have been implemented have been around 50-300 animals. Besides the feed lots off site watering structures have been installed instead of watering cattle directly in the river.

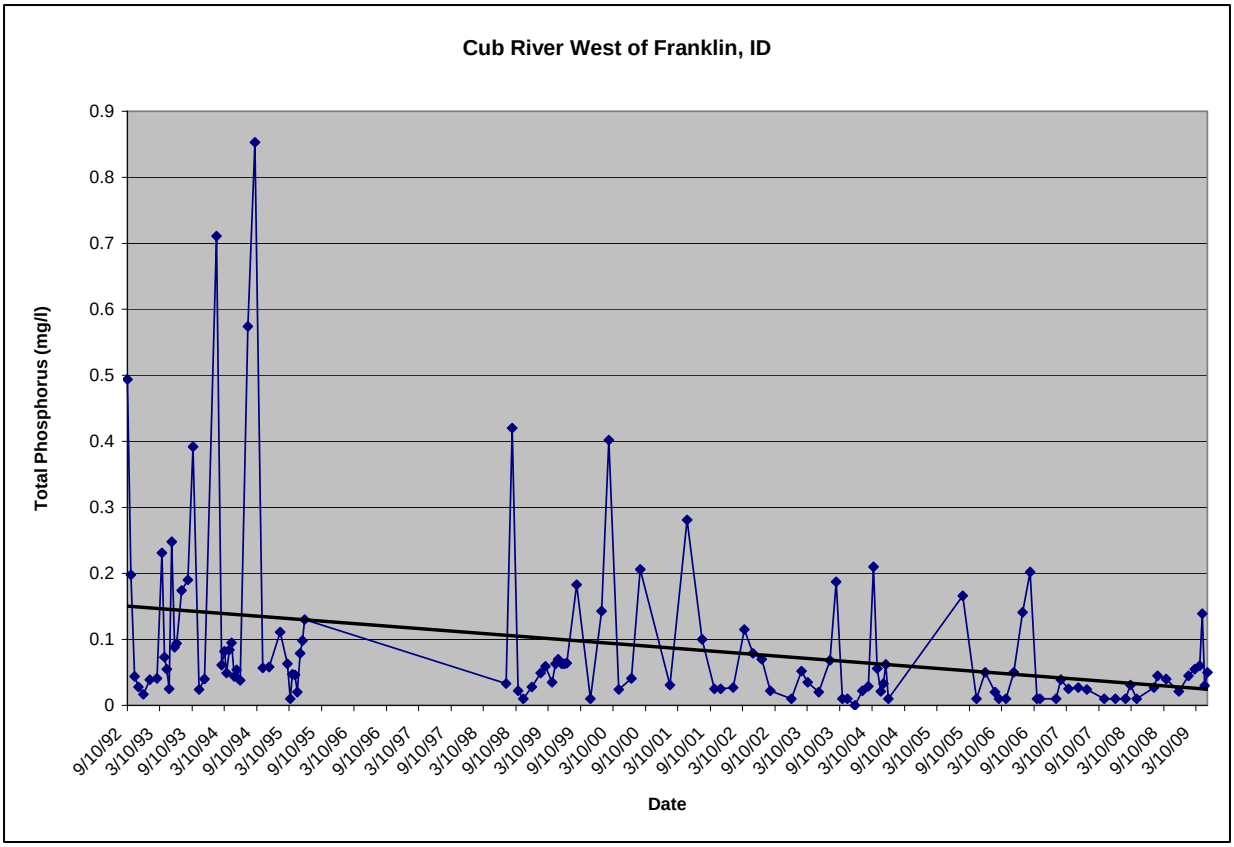
4.0 MONITORING RESULTS

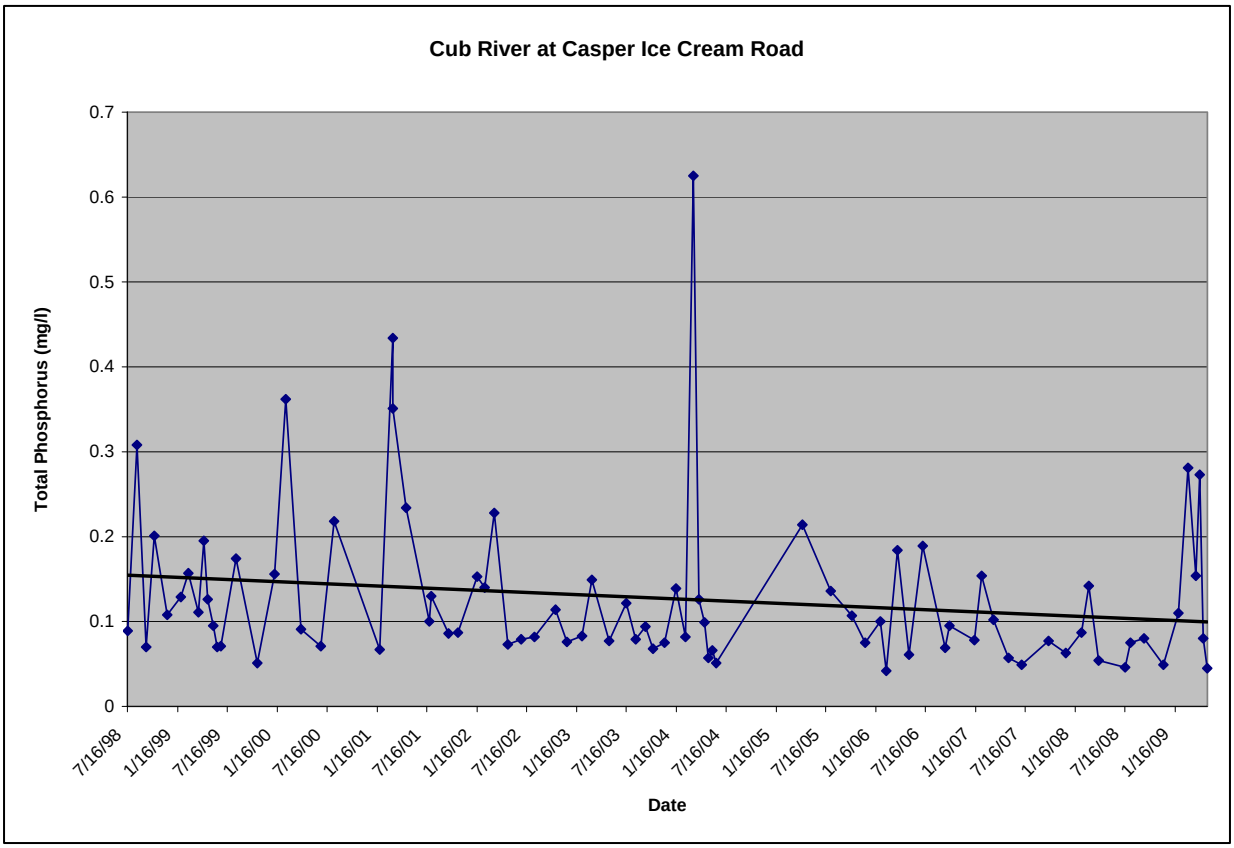
The monitoring goals of this project were to document progress in achieving improved water quality conditions as non-point source control programs were implemented. Monitoring goals were also set to document and review effectiveness of BMPs. Monitoring on this project

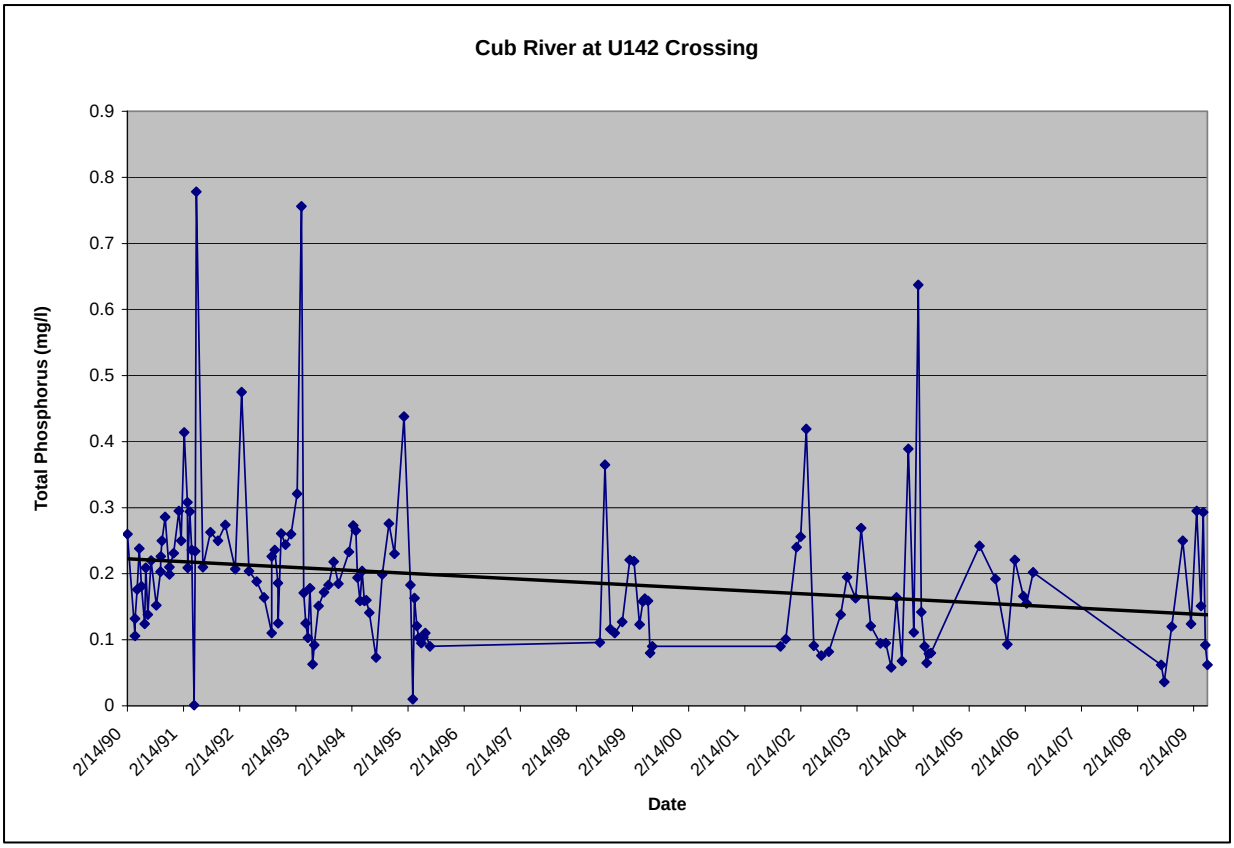
supplements the State's ongoing overall water quality monitoring program. Utah Division of Water Quality will continue to monitor several sites on the Cub River and its tributaries as part of its water quality monitoring program.



4.1 Total Maximum Daily Load (TMDL) Implementation Effectiveness







As seen in the plots above there has been a reduction in the concentration of phosphorus in the river throughout the main river corridor. This decrease has occurred despite the growth in population in the basin. It is anticipated that the improvement will continue as often times it has been found that it can take at least ten years following full implementation for any significant improvements to be observed. Monitoring will continue in cooperation with the Division of Water Quality's monitoring strategy.

4.2 Best Management Practice (BMP) Implementation Effectiveness

Various feed lots have been moved from the river, and cattle exclusion has been successful. Not only have these projects improved the esthetics of the valley. We feel as though we will continue to see improvements in water quality over the next few years. See load reductions for nitrogen and phosphorus in Section 4.4 below.

4.3 Surface Water Improvements

4.3.1 Chemical

As animals are removed from the corridor and stream banks are stabilized the amount of nutrients in the system will continue to decrease. With this decrease in nutrients other water quality standards will also improve such as dissolved oxygen.

4.3.2 Biological

With the implementation of the projects that have taken place and the associated nutrient reductions in the system the dissolved oxygen is improving. This improved dissolved oxygen condition will result in improvements for other living organisms such as macroinvertebrates and fish.

4.3.3 Physical/Habitat

By stabilizing the banks of the rivers and allowing for vegetation to increase along the banks of the rivers, the habitat for fish and other riparian dwelling organisms is improving. Water temperatures are expected to decrease due to better shading along the river, and the gravel substrate on the bed will get larger which will create better spawning habitat for fish.

4.4 Other Monitoring

To help monitor the dissolved oxygen in the Cub River we are planning to deploy probes that continuously measure the DO concentrations throughout the reach form the Idaho state line to the confluence with the Bear River. This data can give us an understanding of agricultural nutrient inputs and oxygen available for the organisms present in the river.

4.5 Results of BMP Operation and Maintenance Reviews

Best Management Practices (BMPs) for the Cub River projects have focused on excluding animal access to the Cub River and its tributaries. BMPs include fencing, improved watering systems, stream bank restoration and re-vegetation, and feedlot relocation projects. Managing manure and nutrient runoff has also been a priority BMP.

When projects are completed a certified planner reviews the work accomplished to verify completion of each practice. If irrigation water management or nutrient management is required by the contract, producers must submit evidence of completion/continuation of each practice tied to EQIP contracts.

The completed projects have excluded livestock from entering the waters of the Cub River. Areas of degradation now have a vegetative cover, reducing the potential for soil erosion and runoff. Operation and maintenance are required for the life of the installed practices or structures.

In the Cub River watershed we have done several fencing projects, stream bank stabilization projects, and off site watering projects. It is difficult to know exactly how many nutrients are taken out of the system through these practices, and results may not appear for up to ten years.

To help estimate the effectiveness of the feedlot repairs or replacements we used the Utah Animal Feedlot Runoff Risk Index (UAFRRI) worksheet. This Worksheet estimates the amount of nutrients taken out of the system through the improvements.

Project	Risk before	Risk after	Nitrogen Reduction (lbs/year)	Phosphorous Reduction (lbs/year)	BOD Reductions (lbs/year)
#7	High	Medium	859	418	3123
#1	Low	Low	0	0	0
#14	High	Low	114	23	114
#2	High	Low	641	308	2812
#3	High	Low	1126	224	5124
#4	High	Low	3306	1074	8012
#5	Medium	Very Low	157	31	557
#8	High	Low	16	8	59
#9	Medium	Low	10	2	38
#11	High	Low	368	179	1339
#13	High	Medium	196	96	714
		Total	**6793**	**2363**	**21892**

5.0 COORDINATION EFFORTS

The Northern Cache Conservation District (District) is one of two district sponsors for the Cache County Local Work Group, which formed the Cub River Steering Committee and will be the lead sponsor. The Cache County Local Work Group and the Cub River Steering Committee, an empowered subcommittee, provided oversight of project planning, cooperator selection, volunteer work, and information sharing generated by this project. The Local Work Group directed the North Cache Conservation District to oversee project development, planning, implementation, approval, creation of fact sheets and educational materials, administration, and reporting. Specific duties (listed below) were transferred, as per Memoranda of Understanding, to the following agencies:

- North Cache Conservation District: approval
- Natural Resources Conservation Service: technical assistance, follow-up
- Department of Environmental Quality: oversight, 319 Grant management
- Utah State University Extension Service: I&E, technical assistance
- Utah Association of Conservation Districts: administer contract, implementation, education, reporting, technical assistance

UACD handled project administration, match documentation and contracting with agencies and individuals. They also provided staffing assistance at the direction of the Districts.

5.1 Coordination with State and Local Agencies

The state and local agencies listed below helped carry out the project by providing support in the following areas:

- Utah State University Extension: Information and Education (I&E), technical assistance
- Utah Department of Agriculture and Food (UDAF): I&E, technical assistance, contract management
- Utah Association of Conservation Districts (UACD): Administration, contracting, staff and technical support
- Cache County: Advisory assistance
- Bear River Resources Conservation and Development (Bear River RC&D): Additional funding and coordination of volunteers

5.2 Coordination with State Environmental Programs

The following State Environmental Programs supported the project in the following areas:

- Utah Division of Water Quality: water quality standard, assessment, monitoring, technical assistance, 319 Grant Management
- Utah Division of Wildlife Resources: advisory and monitoring assistance
- Utah Division of Water Rights: permits, advisory and monitoring assistance
- Utah Division of Water Resources: advisory assistance

5.3 Coordination with Federal Agencies

The following federal agencies made key contributions to the project:

- EPA: Financial assistance, Clean Water Act Section 319
- NRCS: Technical planning, design, and oversight

5.4 Accomplishments of Agency Coordination Meetings

Agencies have been united for the cause of water quality in the Cub River Watershed. Mostly these meeting are in the form of conservation district meetings, however, recently we have begun

to discuss the existing water quality data for the Cub River, and have been discussing the possibilities of beginning the TMDL process on this river. When this process begins we will form an advisory committee that will help decide what projects could be implemented to improve water quality.

5.5 Other Coordinated Resources

The project also benefited from contributions by the following organizations:

- PacifiCorp: Volunteer hours, advisory
- Ecosystems Research, Inc.: advisory
- Boy Scouts: volunteer hours

6.0 SUMMARY OF PUBLIC PARTICIPATION

There have been many opportunities for the public to participate in stream restoration projects in the Cub River watershed. Some of the projects that have been implemented were stream bank stabilization projects. For these projects we received assistance from Utah State University, as well as assistance from other agencies such as the NRCS field office employees. Also many of the land owners have allowed us to conduct tours through the feed lot improvements that they have made to help show other landowners what these projects can do to benefit them and water quality.

7.0 ASPECTS OF THE PROJECT THAT DID NOT WORK WELL

In some cases some of the land owners began reverting back to their old practices, or they did not maintain the project in a manner that resulted in environmental benefits. At times they did not seem to understand exactly what was trying to be achieved by the BMPs. After brief explanations and discussions with the land owners some of these problems were corrected.

8.0 FUTURE ACTIVITY RECOMMENDATIONS

Overall the execution of this grant went well. In the tour given to showcase the projects installed, many of the land owners said that they would have liked to taken the tour years before. In hind site we probably should have given the tours after a few of the projects were installed instead of waiting until the contract was finished up. We do feel as though the tour will supplement additional grants received in this watershed.

9.0 APPENDICES

1. ERI, Nov. 1995. Ecosystem Research Institute, with Bear River RC&D. *Lower Bear River Water Quality Management Plan.* Report prepared for Department of Environmental Quality and Department of Water Quality.

2. Summary of UACD contracts

Project	UDAF contract #	From	To	EPA	Matching	Total	Projects
CR FY99	00-1740 (Job 506)	4/01/99	6/30/04	**$83,580**	**$55,720**	**$139,300**	5
CR FY99	00-1740 (Job 616)			**$4,000**	**$2,667**	**$6,667**	
CR FY00	01-1912	6/01/00	09/30/07	**$80,400**	**$53,600**	**$134,000**	5
CR FY01	02-1676	6/01/01	09/30/07	**$100,000**	**$66,667**	**$166,667**	13
CR FY02 (original)	03-0603	5/01/02	09/30/07	**($148,700)**	**($99,133.)**		
Amendment #1 transfer to Amalga/Benson #03-0604 May 30, 2007				**–$78,000**			
CR FY02 revised	03-0603			**$70,700**	**$47,133**	**$117,833**	
Totals:				**$338,680**	**$225,787**	**$564,467**	

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