

Grant funding for the  
Mancos Conservation District:  
The Mancos River Diversion Project

By Carmen Ogden

A Practicum Report  
Submitted in Partial Fulfillment  
Of the Requirements for the Degree of  
Master of Science  
In Applied Geospatial Sciences

*Northern Arizona University  
Department of Geography, Planning and Recreation  
May 2012*

Approved:

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R. Dawn Hawley, Ph.D.

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Alan A. Lew, Ph.D.

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Aregai Tecle, Ph.D.

## **Acknowledgments**

I would like to give special thanks to my sister Isabel Rollins, her husband, Doug Stroh and Leah Cody, whose help and support was integral in securing the internship with Mancos Conservation District. I would also like to thank Dr. Dawn Hawley, who has supported me in many ways throughout the pursuit of my degrees. In addition, I would like to recognize committee members Dr. Alan Lew and Dr. Aregai Tecle for their support throughout this project. Lastly, I would like to give sincere thanks to the people in Mancos, Russell Klatt and Mark Oliver, whose help was crucial in making this project a success.

## **Abstract**

Mancos Conservation District in Mancos, Colorado, formed to provide educational, financial, and technical assistance to water users in the Mancos Watershed. Operation and management of the District is funded through local, state and federal sources. Unexpected cost overruns necessitated finding additional funding to complete a project originally initiated and funded by the Colorado Water Conservation Board (CWCB) in 2010. This practicum focused on helping the District in identifying and applying for grant funding from the State of Colorado, CWCB to supplement funding for the Mancos River Diversion Project. The practicum was executed by aiding the Mancos Conservation District obtain additional funds from the State of Colorado to complete two diversions on the Mancos River.

## Letter of Significant Contribution



**Mancos Conservation District**  
**P.O. Box 308**  
**Mancos, CO 81328**

January 30, 2012

Re: Carmen Ogden

To whom it may concern,

The Mancos Conservation District has had the pleasure of working with Carmen Ogden in relation to meeting some of the funding needs of the district. Through mutual acquaintances, it came to the board's attention that Carmen was working on her Thesis and they asked her if she would like the opportunity to review the work the board had accomplished on the Mancos River. In reviewing the documents prepared starting with the Rapid Watershed Assessment and continuing through the Watershed Management Plan, Carmen was able to get an overview of the plans and funding needed in the watershed for projects and on-going management.

Carmen wrote a grant for funding for our diversion project which was the hot ticket item at the time. This project consists of replacing old, dysfunctional diversions in the river with engineered and environmentally designed diversions that include placement of fish habitat pools in the design. This project will be on-going for many years. Although Carmen's grant was not funded, the grant did come to the attention of the Colorado Water Conservation Board. They had funds available that they were willing to give to the project under the budget and grant provisions Carmen had written.

She also wrote a letter of inquiry to the Walton Foundation. This letter was met with great enthusiasm from the foundation and although they were unsure if the Mancos watershed qualified for their funding, they were impressed with the work that had been done in this watershed and sent a representative to tour the projects and meet with our board of supervisors. Through this meeting the representative, Ms. Kelly, noted that we did fit their funding requirements, but not geographically. Even so, because of the work done, and the fact that we fit the funding requirements for the work we were doing, Ms. Kelly told the board she would see what she could do. At this point, we are still on their list and may yet receive funding through the foundation.

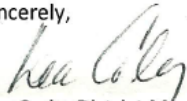
Carmen was extremely thorough in her documentation, her grant writing proposal and inquiry letter. She was very professional and pleasant to work with. This project was a win-win for all involved

and something the board had not had the pleasure of doing before. It was a new experience and worked very well into the education promotion that the board enjoys being involved in.

Not only is the board thrilled with the results of working with Carmen, but should she be looking for work on a contract basis doing grant writing or any sort of watershed work, the board would love to have her back.

If you have any questions regarding the work Carmen has done or how she performed it, please do not hesitate to contact me. Thank you!

Sincerely,

A handwritten signature in dark ink, appearing to read "Lea Cody", is written over a horizontal yellow highlight.

Lea Cody, District Manager  
Mancos Conservation District

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## **Introduction**

The practicum project outlined in this report is the result of an internship with the Mancos Conservation District (MCD) in Mancos, Colorado. Human requirements for development of water delivery systems in agricultural production have made it necessary for the Mancos Community to find more efficient and less environmentally invasive methods of providing adequate quantities of good quality water to landowners and managers of the region. Protecting existing farmland and watersheds are critical to the region's economy and stability, as well as the environmental benefits of open space, food and cover for wildlife, flood control and the aesthetic value of natural resources.

The Mancos Valley Watershed Group formed in 2006, brought together parties interested in the future health of the Mancos River. The Watershed Plan was completed based on studies conducted by the Natural Resources Conservation Service (NRCS) and by Peter Stacey, Ph.D., University of New Mexico. Seven stakeholder meetings were held to discuss the process, develop goals and objectives and next steps. The purpose of the watershed management plan was to identify and develop watershed management objectives to address problems that include high concentrations of zinc and copper, impacts of historical levees, degraded diversion structures and low summer flows. In addition, a water quality and benthic macro invertebrate monitoring component of the plan was developed to ensure that the management measures recommended were working. As a result of these studies, restorative actions that could benefit the river's current health and its future conditions were identified.



In the process, the need to upgrade the aging, 19<sup>th</sup> century irrigation infrastructure was recognized as a critical action that needed attention in order to improve the functioning capacity of the river. The poor condition of the diversion structures was degrading the river channel and riparian community and resulting in an inefficient and poorly measured water delivery system (Mancos, 2011). In order to achieve conservation goals of improving its water delivery system while also maintaining its environmental integrity, there is an ongoing need for grant funding to meet the financial constraints of watershed management in rural Colorado.

This paper identifies the context of the project by discussing the background of the Mancos River Valley and describing the geography and the issues the Mancos River faces. Included in this practicum are a literature review of relevant topics, a chronological journal of progress and events and an update on the current status of the project. Other pieces of information included as appendices consist of MCD Board meeting minutes, grant applications, reports, maps, photos and other pertinent data.

## **Purpose**

The purpose of this practicum was to aid the Mancos Conservation District in their efforts to improve the health of the Mancos River by identifying potential grant funding and technical and educational opportunities for the Mancos River Diversion Project. The components of this practicum project included identifying needs, organizing available reports and watershed information, and finding and applying for project funding as partial fulfillment of the requirements of a Master's of Science degree in Applied Geospatial Science. The practicum encompassed valuable real life experience in writing grant proposals,

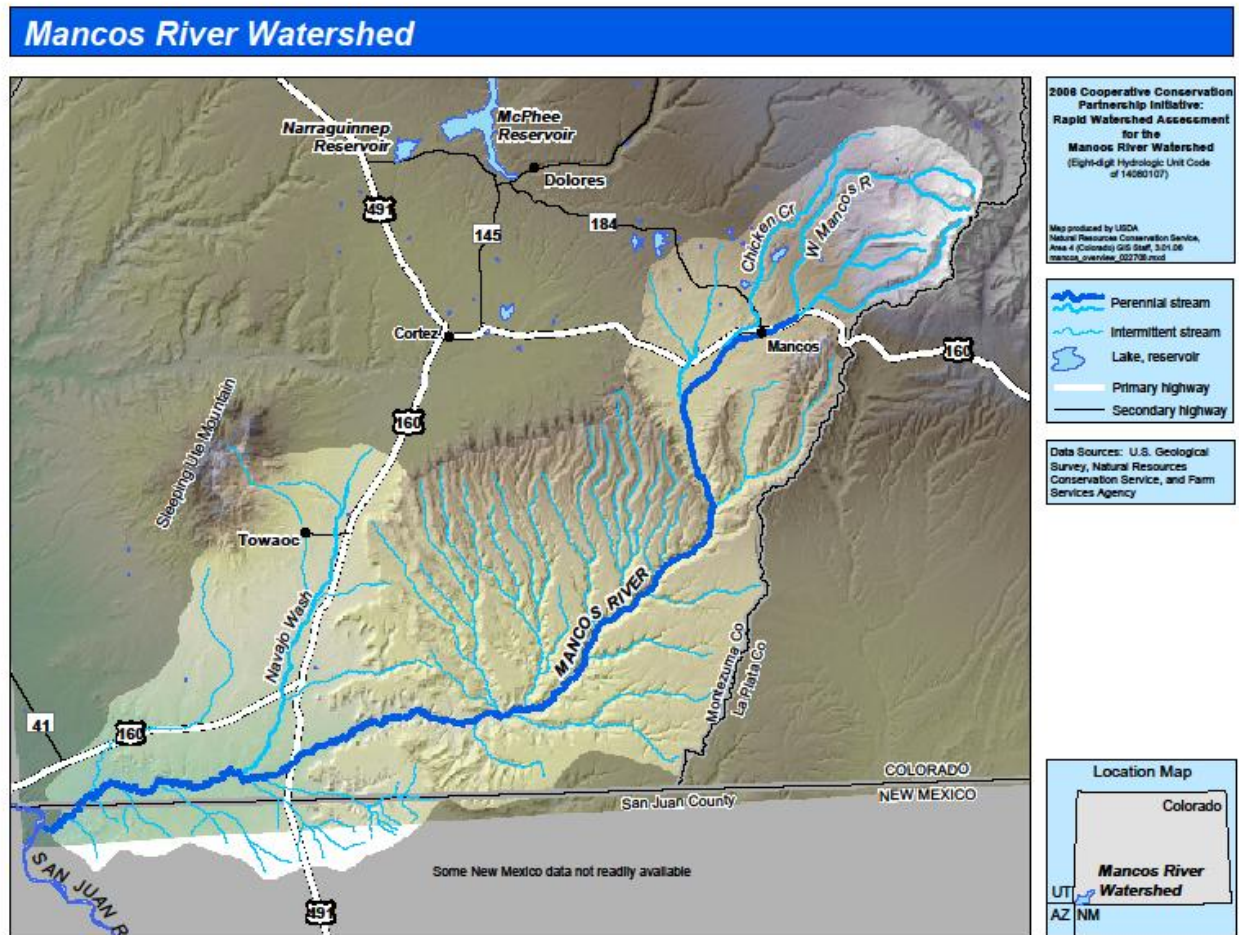
researching watershed management problems and solutions and working with engineers, hydrologists, scientists, the Colorado Water Conservation Board and regional policy makers.

## **Area Background**

Mancos, Colorado is a Statutory Town in Montezuma County, located in the southwestern corner of the state near the Four Corners area. The population was 1,336 at the 2010 census. The Town was founded in 1894, near the site where early Spanish explorers first crossed the Mancos River. Originally laid out as a railroad town, the older part of Mancos stretches for approximately one mile along both sides of the river, while the newer part lies north of the old railroad alignment. The town of Mancos is a small rural community historically inseparable from agriculture in a semi-arid climate that is dependent upon irrigation and hard work. The community also recognizes that the character of the valley is changing and that it must deal with an increasing population less involved with agriculture. The National Park Service recognizes the important role that the Mancos River provides to fish and wildlife and has taken steps to protect this value. The Ute Mountain Utes utilize the Mancos River for farming and also recognizing its role in providing critical habitat to native fish and wildlife that depend on healthy riparian habitats (Mancos, 2011).

The Mancos River flows from east to west through the town, and then flows to the south into Mancos Canyon, on the west and south toe of the Mesa Verde. The Mancos River originates in the western flanks of the La Plata Mountains, a part of the western sub-range of the San Juan Mountains in southwestern Colorado. The river spans elevations that range from 4,000 ft. to 13,000 ft. and flows to the southwest through the Mancos Valley, the town

of Mancos and the eastern edge of Mesa Verde National Park. It continues its way through the Ute Mountain Ute Reservation and onto the Navajo Nation before emptying into the San Juan River in NW New Mexico. The river is 116 miles long and drains an area of approximately 800 square miles (Mancos, 2011).



**Figure 1. Mancos River Watershed**

Native Americans have used the Mancos River watershed for agriculture, hunting and fishing, and various other purposes for thousands of years. At the present time, most human activities are focused in the upper parts of the watershed. Intensive settlement and the

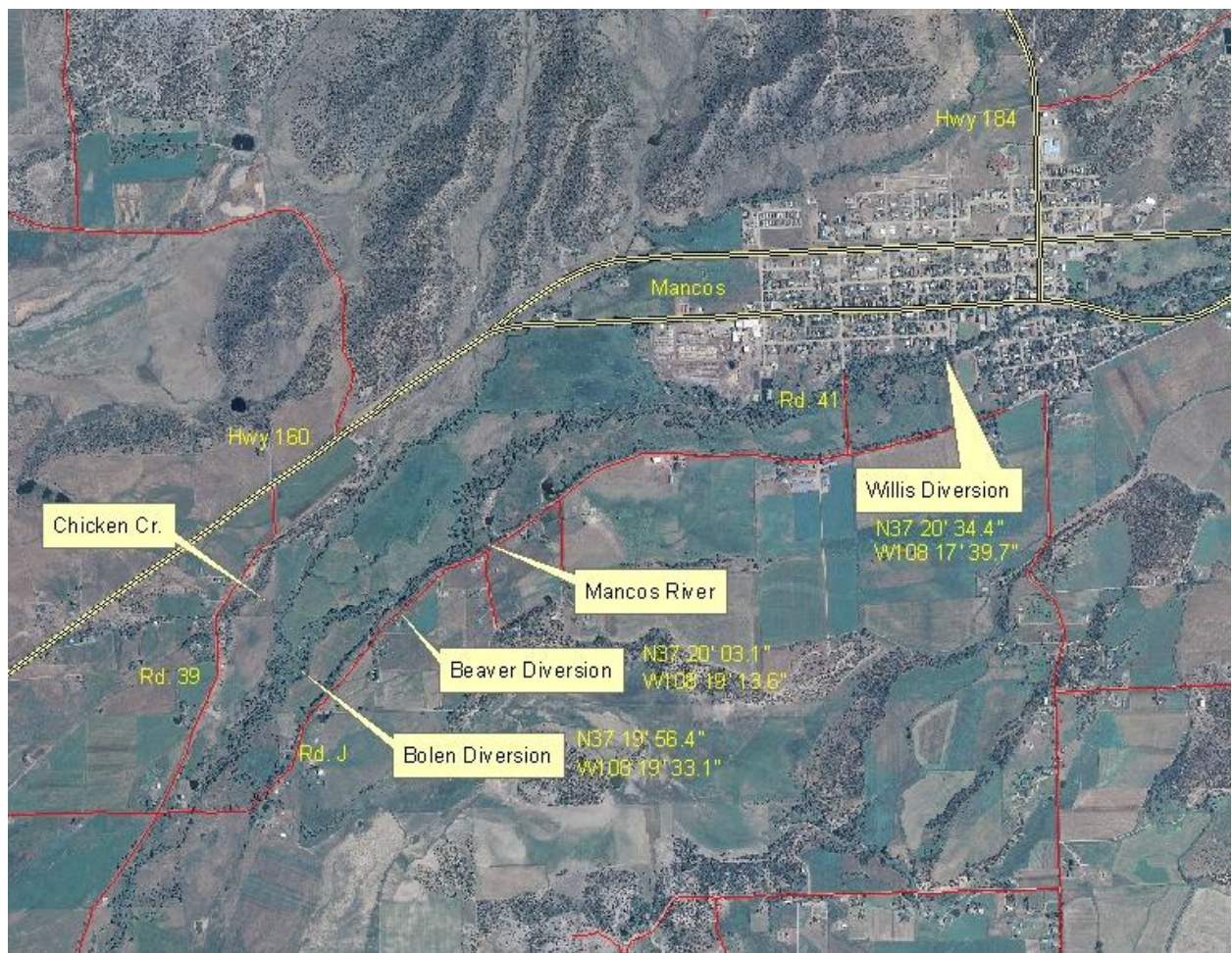
modification of the Mancos River and its tributaries began around 1876, when local farmers and ranchers began constructing irrigation canals to bring water from the Mancos River to cropland and pasture in various parts of the Mancos Valley and by the beginning of the 20th century a large network of irrigation ditches and laterals began operating. The US Bureau of Reclamation estimated that in 1994 approximately 14,900 acres in the Valley and the surrounding areas were used for agricultural production of alfalfa, grasses and small grains. At that time, 11,700 acres were irrigated: 9900 acres by flood irrigation and 1800 acres with sprinklers (Yochum 2004). To deliver water to the fields, there are approximately 46 water diversions made on both the main Mancos River and on its tributaries. There are also several large storage reservoirs that are located above Mancos Valley itself, including Jackson Gulch and Weber reservoirs.

## **Project Background**

The Mancos River supplies water to many entities for varied purposes. Along with its tributaries, the river supplies water to the town of Mancos and outlying residents, to the Ute Mountain Tribe, surrounding ranches and farms for irrigation, to Mesa Verde National Park for municipal water, and is essential to wildlife habitat health (Mancos, 2011). Due to fractional management and divergent needs of the many users in the watershed, the ecological health of the natural environment in this watershed is challenged. Several critical issues impacting the health of the watershed were identified by studies conducted by Peter Stacey and the NRCS. The factors include: stressed ecosystems because of drought conditions, low stream flows during summer months exasperated by water diverted for irrigation, bank erosion, diminished flood plains, and the spread of invasive plant species.



The Mancos Watershed Group prepared a watershed plan based on the results of these studies and identified management goals for the watershed. The goals identified were to develop a cold water fishery, upgrade diversion structures, improve the functioning capacity of the river and meet the State of Colorado's goals for dissolved copper. It was determined that upgrading the outdated irrigation diversions would improve overlapping goals determined by the group and diversion improvement projects were identified as priorities.



**Figure 2. Diversion Map**

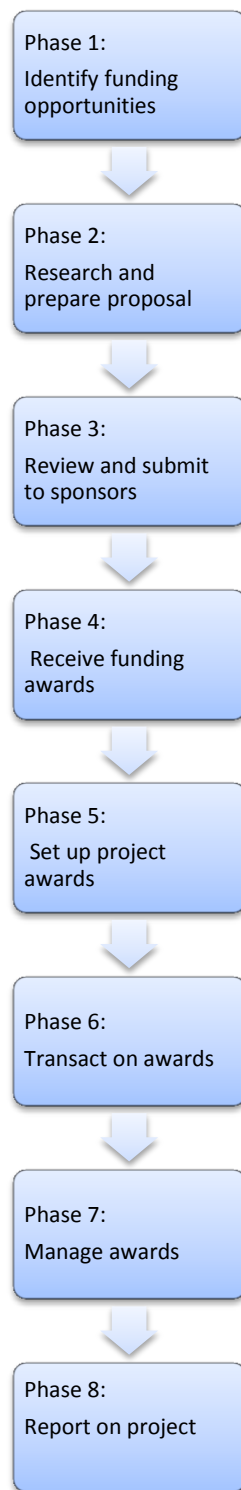
An inventory of the diversion structures was completed that identified each structure by photograph and GPS coordinates. The goal of this study was to identify the work necessary to reconstruct the most infirm and inefficient in-stream diversion structures. The structures were prioritized based on the characteristics that appear to have a major impact on the river system. Impacts included downgrading of the river, cut-banks, drying of the riparian area, structures that require substantial amounts of maintenance with a backhoe or track hoe, and those that inhibit fish passage (Mancos, 2011). Additionally, there is research that indicates metals may be removed from river systems by increasing the assimilative capacity of a stream. This occurs with increasing sinuosity of the stream, decreasing fine sediments and increasing riparian health and riparian wetlands.

The scope of the diversion project was outlined and funds were requested from the CWCB and the NRCS to begin the initial phase of the project. Funding from the CWCB Southwest Basin was acquired in the amount of \$24,753 and funding from the NRCS was requested in the amount of \$46,125. The project objectives were:

1. Stabilize the river bed at the ditch company points of diversion:
  - a. Place a structure in the riverbed to preserve present elevation and eliminate the need for temporary dams to divert water into the inlet channel.
  - b. Help the river to remain in the present channel and preserve adequate water depth at inlet the channel.
  - c. Armor riverbanks above and below the inlet channel to survive 100-year flood events.
  - d. Reduce maintenance of the diversion structure and increase stream flows.
2. Develop flood plain capacity to pass floodwaters with minimal scouring of vegetation and soils.
3. Install gate structure where necessary to control water entering the inlet channel.
4. Discourage braiding of the river channel above and below the point of diversions.

5. Encourage healthy riparian habitat in the vicinity of the point of diversion.
6. Contribute, if possible, to restoration of sustainable fishery in river below the town of Mancos.
7. Seek funding from other stakeholders and beneficiaries of the proposed work.
8. Integrate the project into flood control planning with the Mancos Conservation District and the river bottom landowners.
9. Map all of the diversion structures using a GPS.
10. Begin conducting the analyses necessary to propose new instream flow appropriations on critical stream reaches in the study area. Analysis requires identification of the proposed stream reaches and the upper and lower terminals of the proposed reaches, documentation of the existence of a “natural environment,” quantification of the amount of water required to preserve the natural environment to a reasonable degree, hydrologic analyses which indicate that water is available for appropriation on the proposed stream reaches, and specific information as to why the stream reaches should be afforded protection under the Instream Flow Program. Document the information in a report. Print and deliver copies to Mancos Conservation District, USBR, and Colorado Water Trust.

Grant funding was received in 2010 for the survey and design of the highest priority diversion structures, however due to costs associated with preparing Design Reports and obtaining NRCS approval on the first diversion project (the Beaver) and the on-going process for the Willis diversion, additional funding was needed to complete the Bolen project. The structures would replace three temporary diversion structures that require maintenance after the spring high flows. Original NRCS funding for the diversions required that construction be initiated in 2011. In order to meet the requirements of the NRCS grant, additional funding for this project was critical. Funding was requested for planning the Bolen structure and construction of three diversion structures from the CWCB as the subject of this practicum in April of 2011.



**Figure 3. Grant Process**



## **Practicum Process**

*Discussion about the internship with the Mancos Conservation District as a potential practicum began in January 2011. By March 2011, the district board had approved the internship; work began and continued through August of 2011.*

### **January – February 2011**

In the middle of January 2011, dialogue began with Leah Cody, secretary of the Mancos Conservation District. The watershed manager had recently vacated her position and the MCD was in need of finding additional funding and someone to help find funding for a diversion improvement project that was in the works but had stalled due to cost overruns. The needs of MCD were of interest to me as a potential internship/practicum project. A proposal was written outlining the internship project. The MCD board was approached about the internship project in early February during their monthly board meeting and the proposal was unanimously accepted. Email correspondence began with Leah Cody to begin the process of becoming acquainted with the diversion project.

### **March 2011**

I attended the MCD board meeting in Mancos, Colorado, on March 8, 2011 to introduce myself and my proposed project to the board in person. I met with the board members and gave a brief presentation on my qualifications, education and project goals. After the board meeting, I met with Leah Cody to find out what materials and studies were available. Contact via email with Russell Klatt of the NRCS proved to be the most helpful. Mr. Klatt was well organized and had copies of the studies that had been done for the watershed over the past

few years as well as some previous grant work that had been done by Chester Anderson, an independent contractor hired by MCD to take on the watershed grant work. I began to look at upcoming grants to find something that would fit the diversion project criteria and decided to apply for a Healthy Rivers grant through the Colorado Water Conservation Board. This agency plays a major role in water issues, policy and funding in the State of Colorado. The grant application deadline was April 30; I had about 7 weeks to research and prepare the grant application. I began corresponding with Mark Oliver of Basin Hydrology and Russell Klatt of the NRCS, both proved to be very helpful with the technical aspects of the grant application. The Healthy River Fund was in the form of planning grant and program grants. The diversion project was in need of both types of funding to proceed, planning the structures and constructing them. After discussing this with Chris Sturm at the CWCB, It was decided that the best course of action would be to divide the project into two parts. Mr. Sturm informed me that the Healthy Rivers fund in 2011 was severely underfunded. I went ahead and prepared and submitted the grants to the CWCB by the deadline.

### **May – August 2011**

While preparing the grant applications, it came to my attention that the Watershed Plan was still in the draft phase. During May, I corresponded with Chester Anderson and Leah Cody to find out the status of the Watershed Plan. Mr. Anderson finalized the plan at the end of May. Early in June 2012, I attended the Mancos Board meeting to present my plan for the next few months. In my research, I found the Walton Foundation could be a potential source of (private foundation) funding for the MCD and decided to write to the Foundation and see if they would be interested in funding the MCD projects. At the beginning of August, Leah Cody

heard back from the CWCB, the Healthy River fund was underfunded but CWCB found other resources to fund both the planning and program portions of the project based on the grants I wrote.

### **October 2011**

The Walton Foundation contacted Leah Cody and sent a representative to meet with the MCD. The representative found that Mancos was outside of its funding area demographically, however fit within their conservation goals. The Walton Foundation has kept in contact with Leah Cody, sending the MCD information on other potential sources of funding for the Mancos River.

### **March 2012**

I made contact with Leah Cody and Russell Klatt to find out how the diversion project was progressing. Russell sent me a draft final report for the CWCB and some pictures of the completed diversions.

## **Healthy Rivers Planning Grant**

Cover Letter and Application

April 29, 2011

Dear Mr. Sturm:

The Mancos Conservation District, Mancos Watershed Partnership, along with three ditch companies and 47 landowners in the Mancos Watershed are pleased to submit an application for funds from the Colorado Water Conservation Board, Health Rivers Fund.

We are encouraged to have this opportunity to continue our efforts to address resource concerns in the Mancos Watershed and to protect the ecological integrity of the Mancos River while at the same time providing irrigation water and many economic and ecological benefits to the people and communities within the Mancos Watershed.

Please accept the following applications and draft watershed plan.

If you have questions regarding these applications please feel free to contact:

Carmen Ogden  
Grant Writing Intern, Mancos Conservation District  
[carmenogdeno@live.com](mailto:carmenogdeno@live.com)  
928-853-3553

T. Mark Oliver  
Basin Hydrology, Inc.  
[mark@basinhydrology.com](mailto:mark@basinhydrology.com)  
970-903-0366

Chester Anderson  
B.U.G.S. Consulting  
[chester@bugsconsulting.com](mailto:chester@bugsconsulting.com)  
970-764-7581

**Mancos Conservation District  
Healthy Rivers Fund Grant Information**

**Planning Proposal Summary**

**Project Title:** Bolen Diversion Design Report and NRCS Approval, Mancos Colorado

**Project Location:** Bolin ditch (37.332946N, 108.324480W) located on the Mancos River, southwest of the town of Mancos

**Grant Type:** Planning

**Grant Request Amount:** \$8,545 (\$7,545 Report & Approval, \$1,000 for administration costs.)

**Cash Match Funding:** Montezuma County Commissioners have committed \$2,000 in cash from their Conservation Trust Funds for the design phase of the diversion project. This match will be used for the Bolen diversion.

**Project Sponsors:** Mancos Conservation District  
Eldon Simmons, Mancos Conservation District President  
email: rafterkbar@hotmail.com

**Contact Person:** Project Manager: Chester Anderson  
Mancos River Watershed Project  
email: chester@bugsconsulting.com

**Project Description:** Funding from the Healthy Rivers fund is requested so that Basin Hydrology can prepare a NRCS-required Design Report for the Bolen diversion and to obtain NRCS approval so that NRCS funds can be used for project construction. Grant funding was received in 2010 for the survey and design of this diversion structure, however due to costs associated with preparing Design Reports and obtaining NRCS approval on the first diversion project (the Beaver) and the on-going process for the Willis diversion, additional funding is needed to complete the Bolen project. NRCS funding stipulates that construction be initiated in 2011. The Bolen site is experiencing bank erosion associated with previous bank armoring work completed after a large flood event. The diversion site is also at a site where flows within the channel (both low flows and high flows) split into two separate channels. It is highly likely the NRCS will require a thorough analysis of the hydraulic impacts of a formal diversion structure and concurrent channel stabilization measures. Detailed site surveys for Bolin diversion site were completed in 2010 by Basin Hydrology, Inc. (BHI).

## **Healthy Rivers Project Grant Proposal Mancos River Diversion Project**

April 29, 2011

### **Overview:**

The Mancos Valley Watershed Group was formed in 2006 and has brought together riverfront landowners, farmers, ranchers, environmentalists, irrigation companies, recreationalists and concerned members of the community to address issues facing the watershed group. In order to achieve conservation goals of improving water delivery systems while maintaining environmental integrity, several studies of the watershed have been conducted including a Rapid Assessment prepared by the NRCS and a Functional Assessment by Peter Stacey from the University of New Mexico. Based on the findings from these reports, a draft Watershed Plan and Source Water Protection Plan for the watershed have been completed.

Some pieces of critical importance emerged from the studies initiated by the Watershed Group. First and foremost, a need to continue upgrading aging, 19<sup>th</sup> century-vintage irrigation infrastructure that is taking its toll on the Mancos River including: degradation of the river channel, inefficient and poorly measured water delivery, and frustrated irrigators unable to afford ongoing maintenance. A major portion of this degradation occurs at ditch diversion sites. Our long-term goals for our watershed management and protection plan are to work with irrigators/irrigation companies and landowners along the Mancos River to restore the capacities of the river system. This can be done by taking a holistic approach to the above described situations. Montezuma County Commissioners have committed \$2,000 in cash from their Conservation Trust Funds for the design phase of the diversion project. This match will support the process necessary to reach this goal. The aging diversion structures have been examined by a team of experts (engineers, water commissioner, ditch owners, and an ecologist) working together to consider all possibilities of reform/restoration/irrigation efficiency improvement.

### **Project Description:**

Funding from the Healthy Rivers fund is requested so that Basin Hydrology can prepare a NRCS-required Design Report for the Bolen diversion and to obtain NRCS approval so that NRCS funds can be used for project construction. Grant funding was received in 2010 for the survey and design of this diversion structure, however due to costs associated with preparing Design Reports and obtaining NRCS approval on the first diversion project (the Beaver) and the on-going process for the Willis diversion, additional funding is needed to complete the Bolen project. NRCS funding stipulates that construction be initiated in 2011. The Bolen site is experiencing bank erosion associated with previous bank armoring work

completed after a large flood event. The diversion site is also at a site where flows within the channel (both low flows and high flows) split into two separate channels. It is highly likely the NRCS will require a thorough analysis of the hydraulic impacts of a formal diversion structure and concurrent channel stabilization measures. Detailed site surveys for Bolen diversion site were completed in 2010 by Basin Hydrology, Inc. (BHI).

**Grant Request Amount: \$8,545**

This is based on \$9,545 report & approval costs and \$1,000 for administration costs and \$2,000 in cash match from the Montezuma County Commissioners Conservation Trust Fund.

**Cash Match Funding:**

Montezuma County Commissioners have committed \$2,000 in cash from their Conservation Trust Fund for the design phase of the diversion project. This match will be used for the Bolen diversion.

**Diversion Project Objectives:**

11. Stabilize river bed at ditch company points of diversion:
  - a. Place structure in riverbed to preserve present elevation and eliminate need for temporary dams to divert water into inlet channel.
  - b. Help river to remain in the present channel and preserve adequate water depth at inlet channel.
  - c. Install channel and bank friendly structures to protect the banks during high flows and to maintain channel bed stability.
  - d. Reduce maintenance of the diversion structure and improve diversion efficiency which will result in more water in the downstream channel.
12. Maintain flood plain capacity to pass floodwaters with minimal scouring of vegetation and soils.
13. Install gated structure where necessary to control water entering inlet channel.
14. Discourage braiding of river channel above and below point of diversions.
15. Encourage healthy riparian habitat in the vicinity of the point of diversion.
16. Contribute, if possible, to restoration of sustainable fishery in river below the town of Mancos by constructing in-channel structures that are not fish barriers.
17. Seek funding from other stakeholders and beneficiaries of the proposed work.
18. Integrate project into flood control planning with Mancos Conservation District and river bottom landowners.
19. Map all of the diversion structures using a GPS.



### **Project Staff:**

The project, including data collection, preparation of design plans and opinion of costs, will be done by Mark Oliver, Basin Hydrology. Mark Oliver has 27 years of experience, offering specialized surface water hydrology services in fluvial geomorphology, wetlands, and watershed-scale drainage and erosion issues. Mark performs surveys, detailed hydrologic and hydraulic analyzes, prepares construction plans, secures permits and provides construction oversight.

Chester Anderson is the owner of B.U.G.S Consulting and will provide support services as needed. B.U.G.S. a small independent environmental research and monitoring firm which contracts with watershed groups and state and tribal entities to offer grant administration, development of Quality Assurance Project Plans (QAPP), development of nutrient criteria, and coordinating and managing efforts among a variety of governmental agencies that result in watershed-wide research and monitoring programs.

Lea Cody is the district manager for the Mancos Conservation District and will be responsible for bookkeeping and grant accounting.

Mancos Conservation District in-kind; The Diversion Project is overseen by the Mancos Conservation District Board and an advisory board whose members include: Dr. Dick White, Vice-President of the MCD Board, Dr. Jack Burk, President Emeritus of the MCD Board, Raymond Keith, Former Project Manager for the Salinity Project, and Eldon Simmons, President of the MCD Board.

### **Partnership Accomplishments:**

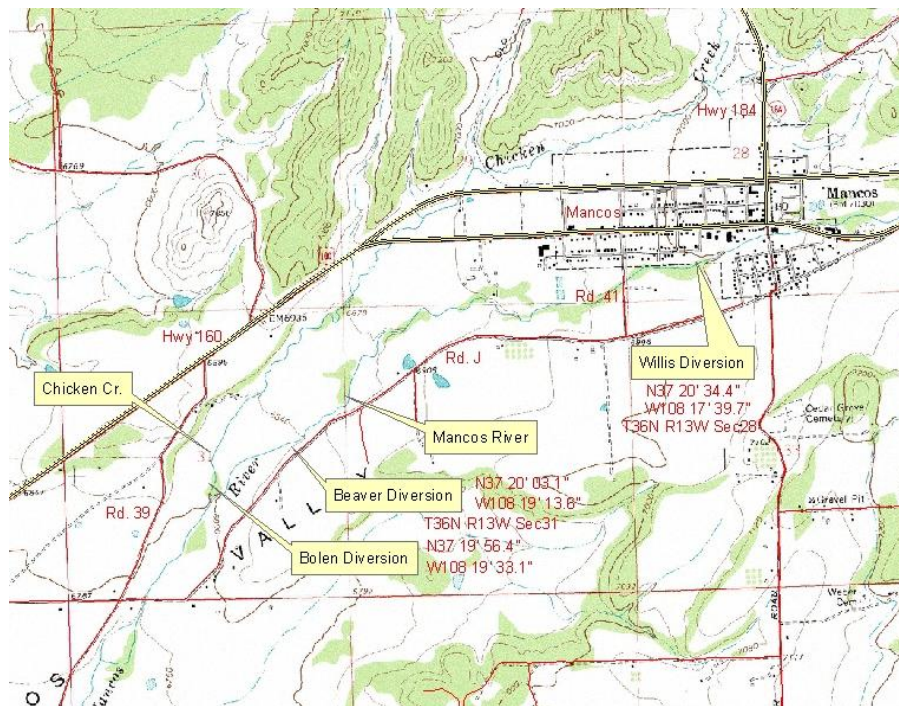
To this date the partnership has accomplished the following objectives:

- Water conservation practices with NRCS
- Monthly water quality monitoring through Colorado River Watch
- Riparian corridor assessment of 17 reaches of the river and its major tributaries
- 60 acres of Tamarisk & Russian olive eradication
- Two in-stream aquatic habitat/bank stabilization enhancement projects
- Fencing of livestock off riparian corridors
- Compilation & analysis of all studies to date of East Mancos River
- Landowner survey of resource concern
- Surveying and prioritization of all diversion structures in the watershed
- Attained funding for initial portion of design and approval for this project
- Completion of design and approval for Beaver diversion
- Design and approval in progress for Willis and Bolen diversions

### Ditch Description:

1. Henry Bolen Ditch Company. The Bolen pipeline intake structure is on Chicken Creek just below a transfer ditch that delivers water from the point of diversion on the River to Chicken Creek, a distance of approximately 400'. The existing diversion structure consists of a log jam and excelsior rolls. There has been substantial stream bank erosion upstream of the structure and channel braiding downstream. A permanent structure needs to be constructed and stream bank enhancements established. There is no measuring device at the point of diversion. The mainline flow meter is located approximately 3000 feet from the intake structure at the first County Road crossing and is installed in a 48" pit on 24" diameter PVC pipe. There is no means at the structure to accurately measure the amount of water flowing into the pipeline. Therefore, the water users and the Water Commissioners rely on the flow meter. There is a new head gate at this irrigation ditch that connects to the new pipeline. The head gate and pipeline were developed with a loan from the CWCB.

**Map of City of Mancos, River and Diversion Locations**



### PLANNING GRANT BUDGET - BOLEN DIVERSION

TASK	CHRF Funding	Other Funding 1	Other Funding 2	In-Kind Funding	Total
Bolen Site Survey - done	done				
Design Bolen	in process	\$2,000			
Bolen Report and Approval	\$7,545				\$7,545
Watershed Admin	\$1,000				\$1,000
<b>TOTAL</b>	<b>\$8,545</b>	<b>\$2,000</b>	<b>\$0</b>	<b>\$0</b>	<b>\$10,545</b>

#### Project Management

Project manager will arrange meetings between supervisors, contractors, ditch company representatives and water commissioner as necessary throughout the project. PM is responsible for working with each of the four contractors on each element of the project, creating a cohesive timeline, supervising contractors as necessary, acting as liaison with funding agency, track billing and progress, and reports regularly to Mancos Conservation District Board. Manager is responsible for hiring contractors, negotiating and writing contracts; overseeing and supporting decree analysis partners with field trips, maps, contacts, meetings. PM will also attend ditch company meetings to explain project and progress. PM will write the final report for the CWCB upon project completion.

Completion Date: Fall 2011

### Bolen Diversion Photos



## **Healthy Rivers Program Grant**

Cover letter and application

April 29, 2011

Dear Mr. Sturm:

The Mancos Conservation District, Mancos Watershed Partnership, along with three ditch companies and 47 landowners in the Mancos Watershed are pleased to submit an application for funds from the Colorado Water Conservation Board, Health Rivers Fund.

We are encouraged to have this opportunity to continue our efforts to address resource concerns in the Mancos Watershed and to protect the ecological integrity of the Mancos River while at the same time providing irrigation water and many economic and ecological benefits to the people and communities within the Mancos Watershed.

Please accept the following applications and draft watershed plan.

If you have questions regarding these applications please feel free to contact:

Carmen Ogden  
Grant Writing Intern, Mancos Conservation District  
[carmenogdeno@live.com](mailto:carmenogdeno@live.com)  
928-853-3553

T. Mark Oliver  
Basin Hydrology, Inc.  
[mark@basinhydrology.com](mailto:mark@basinhydrology.com)  
970-903-0366

Chester Anderson  
B.U.G.S. Consulting  
[chester@bugsconsulting.com](mailto:chester@bugsconsulting.com)  
970-764-7581

**Mancos Conservation District  
Healthy Rivers Fund Grant Information**

**Project Proposal Summary**

**Project Title:** Mancos In-stream Irrigation Diversion Structures

**Project Location:** 3 Diversions, Beaver (37.334593N, 108.320329W), Bolin (37.332946N, 108.324480W) and Willis (37.343167N, 108.295202W) ditches located on the Mancos River, southwest of the town of Mancos.

**Grant Type:** Project

**Grant Request Amount:** \$19,912. This is based on construction costs estimated at \$13,360 for the Bolen, \$13,360 for the Willis, \$21,400 for the Beaver and administration costs of \$5,500, all of which total \$53,620, less cash matching funds of \$33,708.

**Cash Match Funding:** Each ditch company has committed \$2,000 in cash plus time for a total of \$6,000. National Resources Conservation Service has set aside \$15,371 (for rock and water control structures costs only) at each of the three diversion structures in EQIP funds. The rock and water control structure costs are \$7,820 each for the Bolen and Willis Ditches and \$12,068 for the Beaver Ditch totaling \$27,708. The total cash match, including the \$6,000 from the ditch companies is \$33,708.

**Project Sponsors:** Mancos Conservation District  
Eldon Simmons, Mancos Conservation District President  
email: rafterkbar@hotmail.com

**Contact Person:** Project Manager: Chester Anderson  
Mancos River Watershed Project  
email: chester@bugsconsulting.com

**Project Description:** Funding from Healthy Rivers is requested for construction of three permanent, fish and riparian community friendly diversion structures within the Mancos River below the town of Mancos. A need to upgrade aging, 19<sup>th</sup> century-vintage irrigation infrastructure that is taking its toll on the Mancos River in many ways is critical. Degradation of the river channel, inefficient and poorly measured water delivery, and frustrated irrigators unable to afford ongoing maintenance. A major portion of this degradation occurs at ditch diversion sites. These structures will replace three temporary diversion structures that require maintenance after most spring's high flows. This process further degrades fish and riparian habitat, prevents or greatly impairs fish migration and costs time and money for the local farmers and ranchers. NRCS funding requires that construction be initiated in 2011. These diversions serve 1,990 irrigated agricultural acres.

## **Healthy Rivers Program Grant Proposal Mancos River Diversion Project**

April 26, 2011

### **Overview:**

The Mancos Valley Watershed Group was formed in 2006 and has brought together riverfront landowners, farmers, ranchers, environmentalists, irrigation companies, recreationalists and concerned members of the community to address issues facing the watershed group. In order to achieve conservation goals of improving water delivery systems while maintaining environmental integrity, several studies of the watershed have been conducted including a Rapid Assessment prepared by the NRCS and a Functional Assessment by Peter Stacey from the University of New Mexico. Based on the findings from these reports, a draft Watershed Plan and Source Water Protection Plan for the watershed have been completed.

Some pieces of critical importance emerged from the studies initiated by the Watershed Group. First and foremost, a need to continue upgrading aging, 19<sup>th</sup> century-vintage irrigation infrastructure that is taking its toll on the Mancos River including: degradation of the river channel, inefficient and poorly measured water delivery, and frustrated irrigators unable to afford ongoing maintenance. A major portion of this degradation occurs at ditch diversion sites. Our long-term goals for our watershed management and protection plan are to work with irrigators/irrigation companies and landowners along the Mancos River to restore the capacities of the river system. This can be done by taking a holistic approach to the above described situations. EQIP Funding from the NRCS will support the construction process necessary to reach these goals. The aging diversion structures have been examined by a team of experts (engineers, water commissioner, ditch owners, and an ecologist) working together to consider all possibilities of reform/restoration/irrigation efficiency improvement.

### **Project Description:**

Funding from Healthy Rivers is requested for construction of three permanent, fish and riparian community friendly diversion structures within the Mancos River below the town of Mancos. These structures will replace three temporary diversion structures that require maintenance after spring's high flows. This process further degrades fish and riparian habitat, prevents or greatly impairs fish migration and costs time and money for the local farmers and ranchers. NRCS funding requires that construction be initiated in 2011. These diversions serve 1,990 irrigated agricultural acres.



### **Grant Request Amount: \$19,912**

This is based on construction costs estimated at \$13,360 for the Bolen, \$13,360 for the Willis, \$21,400 for the Beaver and administration costs of \$5,500, all of which total \$53,620, less cash matching funds of \$33,708

### **Cash Match Funding:**

Each ditch company has committed \$2,000 in cash for a total of \$6,000. National Resources Conservation Service has set aside \$15,371 (for rock and water control structures costs only) at each of the three diversion structures in EQIP funds. The rock and water control structure costs are \$7,820 each for the Bolen and Willis Ditches and \$12,068 for the Beaver Ditch totaling \$27,708. The total cash match, including the \$6,000 from the ditch companies is \$33,708.

### **Community Contributions:**

Each ditch company has agreed to contribute matching funds and time to the project. The time commitment will be in the form of coordination, providing access, monitoring, administration, and educating other landowners and ditch companies.

### **Project Objectives:**

20. Stabilize river bed and banks at ditch company points of diversion:
  - a. Place structure(s) in riverbed to preserve present elevation and eliminate need for temporary dams to divert water into inlet channel.
  - b. Help river to remain in the present channel and preserve adequate water depth at inlet channel.
  - c. Install channel and bank friendly structures to protect the banks during high flows and to maintain channel bed stability.
  - d. Reduce maintenance of the diversion structure and improve diversion efficiency which will result in more water in the downstream channel..
21. Maintain flood plain capacity to pass floodwaters with minimal scouring of vegetation and soils.
22. Install gated structure where necessary to control water entering inlet channel.
23. Discourage braiding of river channel above and below point of diversions.
24. Encourage healthy riparian habitat in the vicinity of the point of diversion.
25. Contribute, if possible, to restoration of sustainable fishery in river below the town of Mancos by constructing in-channel structures that are not fish barriers.
26. Seek funding from other stakeholders and beneficiaries of the proposed work.
27. Integrate project into flood control planning with Mancos Conservation District and river bottom landowners.
28. Map all of the diversion structures using a GPS.

### **Project Staff:**

The project, including data collection, preparation of design plans and opinion of costs, will be done by Mark Oliver, Basin Hydrology. Mark Oliver has 27 years of experience, offering specialized surface water hydrology services in fluvial geomorphology, wetlands, and watershed-scale drainage and erosion issues. Mark performs surveys, detailed hydrologic and hydraulic analyzes, prepares construction plans, secures permits and provides construction oversight.

Chester Anderson is the owner of B.U.G.S Consulting and will provide support services as needed. B.U.G.S. a small independent environmental research and monitoring firm which contracts with watershed groups and state and tribal entities to offer grant administration, development of Quality Assurance Project Plans (QAPP), development of nutrient criteria, and coordinating and managing efforts among a variety of governmental agencies that result in watershed-wide research and monitoring programs.

Lea Cody is the district manager for the Mancos Conservation District and will be responsible for bookkeeping and grant accounting.

Mancos Conservation District in-kind; The Diversion Project is overseen by the Mancos Conservation District Board and an advisory board whose members include: Dr. Dick White, Vice-President of the MCD Board, Dr. Jack Burk, President Emeritus of the MCD Board, Raymond Keith, Former Project Manager for the Salinity Project, and Eldon Simmons, President of the MCD Board.

### **Partnership Accomplishments:**

To this date the partnership has accomplished the following objectives:

- Water conservation practices with NRCS
- Monthly water quality monitoring through Colorado River Watch
- Riparian corridor assessment of 17 reaches of the river and its major tributaries
- 60 acres of Tamarisk & Russian olive eradication
- Two in-stream aquatic habitat/bank stabilization enhancement projects
- Fencing of livestock off riparian corridors
- Compilation & analysis of all studies to date of East Mancos River
- Landowner survey of resource concern
- Surveying and prioritization of all diversion structures in the watershed
- Attained funding for initial portion of design and approval for this project
- Completion of design and approval for Beaver diversion
- Design and approval in progress for Willis and Bolen diversions

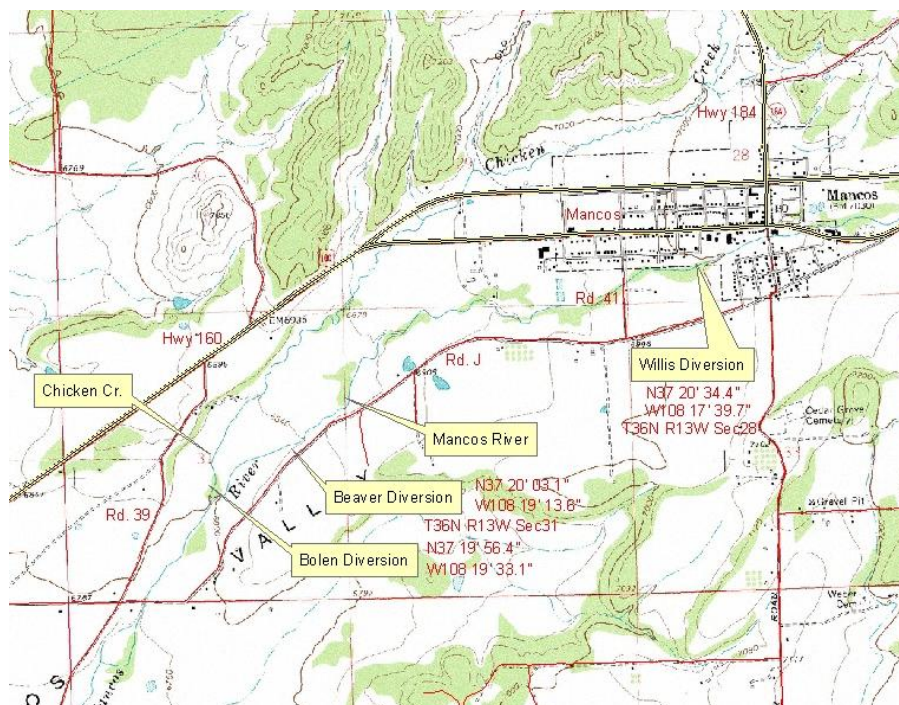
### **Ditch Description:**

2. Mancos Valley Beaver Ditch Company- The intake structure for this ditch has recently been improved and reconstructed by the NRCS but no in-stream diversion structure was ever completed. A non-structural pile of boulders and cobbles have been dumped into the channel to divert water to the intake structure but this diversion methods has to be reconstructed after most spring runoff events. The in-channel diversion will be constructed using large angular boulders installed in a specific manner that provides structural stability while allowing passage of high flows and fish. The Beaver Ditch Company has added a weir and staff gauge at the intake structure as an alternate measurement point, reducing dependence upon a flow meter. Excess flows delivered to the intake structure are returned to the channel a short distance downstream of the proposed in-channel diversion structure. There is a new head gate at this irrigation ditch that connects to the new pipeline. The head gate and pipeline were developed with a loan from the CWCB.
  
3. Henry Bolen Ditch Company. The Bolen pipeline intake structure is on Chicken Creek just below a transfer ditch that delivers water from the point of diversion on the River to Chicken Creek, a distance of approximately 400'. The existing diversion structure consists of a constructed log jam and excelsior rolls. There has been substantial stream bank erosion upstream of the structure and channel braiding downstream. A permanent structure needs to be constructed and stream bank enhancements established. There is no measuring device at the point of diversion. The mainline flow meter is located approximately 3000 feet downstream from the intake structure at the first County Road crossing and is installed in a 48" pit on 24" diameter PVC pipe. There is no means at the structure to accurately measure the amount of water flowing into the pipeline. Therefore, the water users and the Water Commissioners rely on a flow meter. There is a new head gate at this irrigation ditch that connects to the new pipeline. The head gate and pipeline were developed with a loan from the CWCB.
  
4. Willis Ditch – This ditch is suffering the classic affects of years of make-shift diversion tactics and now the river armoring has disappeared, dropping the water level and increasing channelization. The ditch company is worried they won't be able to divert their full allotment of water because the situation has become so severe. The diversion is just downstream of the Mancos School and could possibly be used as a model structure once it is constructed.

## Project Management

Project manager will arrange meetings between supervisors, contractors, ditch company representatives and water commissioner as necessary throughout the project. PM is responsible for working with each of the four contractors on each element of the project, creating a cohesive timeline, supervising contractors as necessary, acting as liaison with funding agency, track billing and progress, and reports regularly to Mancos Conservation District Board. Manager is responsible for hiring contractors, negotiating and writing contracts; overseeing and supporting decree analysis partners with field trips, maps, contacts, meetings. PM will also attend ditch company meetings to explain project and progress. PM will write the final report for the CWCB upon project completion.

**Map of City of Mancos, River and Diversion Locations**



### Construction Cost Estimates Beaver, Bolen and Willis ditches

	Rock	Gravel	Load Rock	Conc. Blk	Conc. Blk	Rock Trans.	Total Mat and Transp.	Const.	Monitoring	total
Bolen	100 CY		\$1,000	12	\$110	\$55	\$7,820	\$3,500	\$2,040	\$13,360
Willis	80 CY	30 CY	\$1,000	12	\$110	\$50	\$7,820	\$3,500	\$2,040	\$13,360
Beaver	154 CY		\$1,200	33	\$110	\$47	\$12,068	\$6,750	\$2,580	\$21,398
total										\$48,118

PROGRAM GRANT BUDGET - BEAVER, BOLEN & WILLIS DIVERSIONS				
	CWCB			
TASK	CHRF Funding	Other Funding 1	Other Funding 2	Total
		NCRS EQIP	DITCH OWNER	
<b>Beaver Diversion</b>				
Beaver Site Survey	done			
Design Beaver Diversion	done			
Beaver Design Report & Approval	done			
Construction - Beaver	7,332	12,068	2,000	21,400
Watershed Coord/Admin	2,500			2,500
<b>Willis Diversion</b>				
Willis Site Survey	done			
Design Willis Diversion	in process			
Willis Design Report & Approval	in process			
Construction - Willis	3,540	7,820	2,000	13,360
Watershed Coord/Admin	1,500			1,500
<b>Bolen Diversion</b>				
Bolen Site Survey	done			
Design Bolen Diversion	in process			
Construction - Bolen	3,540	7,820	2,000	13,360
Watershed Coord/Admin	1,500			1,500
<b>TOTALS</b>	<b>19,912</b>	<b>27,708</b>	<b>6,000</b>	<b>53,620</b>

## **Literature Review**

### **Introduction**

Colorado is a semi-arid state, plagued with limited water sources and drought. As a semi-arid watershed with an ever-growing population and a changing climate, the Mancos River Watershed in south western Colorado is faced with many competing demands for a relatively small quantity of water. The Mancos area and its relationship to water are integrally linked to the sustainability of the watershed area, economically, socially and environmentally. The area has developed as a mainly agricultural area, farms and ranches depend on water delivered to their fields from water diverted from the Mancos River. Water scarcity, development and population growth make water management an issue of great importance. Pressure on water management will continue due to the increased demand on water and a decreased supply, making sound water management integral to providing the users in the Mancos Watershed with a reliable, quality source of water now and in the future.

### **Watersheds**

The total land area that drains surface water to a common point (or common body of water) is called a watershed (Cech 2005). A watershed is delineated by a ridge or drainage divide that marks the boundary of the drainage basin and can be easily identified on topographic maps. Cech (2005) identifies three rules to determine watershed boundaries on a map:

1. Surface water generally flows at right angles across contour lines on a map.
2. Ridges are indicated by the highest elevation contour line in an area.

3. Drainages are indicated by contour lines pointing upstream.

According to Dzurik (2003), watershed planning should encompass entire watersheds. The Environmental Protection Agency (EPA) has developed a three step process for watershed protection which includes identifying problems, involving stakeholders, and integrating actions (Dzurik 2003).

## **Water Resource Planning**

Water Planning has been practiced in some form since ancient times. Dzurik (2003) discussed the evolution of water resources planning and follows its documented course through history where Ancient Egypt, Iraq and China managed and engineered water systems based on scientific principles of hydrology and hydraulics. As early as the seventh century A.D., a sophisticated system of irrigation structures was developed by the Chinese for irrigation. Evidence shows a highly organized system of management was associated with these structures based on an optimal land use pattern (Dzurik 2003). While water planning and projects have existed for thousands of years, a shift in planning to a modern context occurred during the mid to end of the twentieth century.

Historically water has been thought of and consumed as though it were an inexhaustible resource. Cech (2005) identified the historic hydrologic boundary of the 100<sup>th</sup> Meridian between the humid climates of eastern United States, Canada and Mexico and the arid Western regions. Dzurik (2003) stated that as the country expanded westward, agricultural activity in the arid and semi-arid areas was facilitated by small irrigation projects and diversions from small streams and rivers bordering farm property. The demands on the source were usually adequate, due to the small and concentrated population. Pollution was minimal and the quality

of water remained high. Modern human requirements for water have resulted in a water supply diminished in both quantity and quality and a need for effective management.

## **Agriculture and Irrigation**

According to Dzurik (2003), agriculture is the largest user of water nationally. Irrigation accounts for 97 percent of total agricultural use, with the remainder going to rural domestic use and livestock production. Irrigation is a major aspect of agriculture, for irrigation of crops was developed concurrently with settlement of the arid West (Dzurik 2003). Cech (2005) discusses that irrigation water can be obtained by both surface water and ground water sources. In mountainous regions, snowpack accumulated during the winter months melts during spring, contributing runoff to surface water sources. Melted snow can be captured in reservoirs or diverted directly from a river for irrigation. Many irrigated areas in the Western States receive very little precipitation during the summer months and rely heavily and sometimes exclusively on irrigation water supplied from melting snow in the mountains.

Surface water irrigators use various methods to deliver water to their crops (Cech 2005). One method is by diverting surface water from a river to a delivery canal or reservoir, and then it is diverted again to a headgate which directs the water to individual farms. Cech (2005) discusses additional methods of surface water irrigation and states using gravity either for furrow irrigation or wild flood irrigation are methods commonly used around the world. Dzurik (2003) discusses the fact that surface water depletion from irrigation is a major concern in the West. The Colorado River has been so severely reduced by the time it reaches the Gulf of Mexico it is merely a trickle. Demand for water for agricultural purposes will continue despite irrigation technique improvements. Competition for water is expected to be fierce, especially in the arid west (Dzurik 2003).



## The Clean Water Act

The center of U.S. water pollution control strategies is the Clean Water Act (CWA). The Environmental Protection Agency (EPA) is authorized to oversee the CWA and may give authority to States and Tribes (Mancos, 2011). According to the EPA, the Federal Water Pollution Control Act of 1948 was the first major U.S. law to address water pollution. Growing public awareness and concern for controlling water pollution led to sweeping amendments in 1972. As amended in 1977, the law became commonly known as the Clean Water Act (CWA).

According to the EPA, the 1977 amendments:

- Established the basic structure for regulating pollutants discharges into the waters of the United States.
- Gave EPA the authority to implement pollution control programs such as setting wastewater standards for industry.
- Maintained existing requirements to set water quality standards for all contaminants in surface waters.
- Made it unlawful for any person to discharge any pollutant from a point source into navigable waters, unless a permit was obtained under its provisions.
- Funded the construction of sewage treatment plants under the construction grants program.
- Recognized the need for planning to address the critical problems posed by nonpoint source pollution.

As stated by Mancos (2011) under the CWA, the EPA, States and tribes must identify waters that are impaired or threatened by nonpoint sources of pollution, develop short and long term goals for cleaning up the sources of pollution, and identify best management practices (BMP) to be implemented to clean up sources of pollution. The Nonpoint Source Program developed by the EPA emphasized establishment of management strategies, deployment of BMP, education, research and program effectiveness evaluation. This emphasis resulted in the drafting of the *Handbook for Developing Watershed Plans to Restore and Protect Our Waters*

which contains nine elements that the EPA requires to be addressed in watershed plans funded by the Clean Water Act section 319 Nonpoint Source Program funds (Mancos, 2011).

## **Water Management Agencies**

Water resource planning in the United States takes on a multi-layered approach involving agencies on the local, regional, state and federal levels. Cech (2005) discusses this approach by stating that the large number of diverse agencies provide services ranging from drinking water supply to wastewater treatment, irrigation water delivery, flood control, and water quality protection. Generally, local water groups provide the grassroots level of management that services mainly residents. On the next level, regional, state and federal water agencies allow economics of scale to reduce costs and implement legislation and programs to manage water for larger regions and populations (Cech 2005).

According to Dzurik (2003), the water resource management and program preparation on the federal level have historically been the responsibility of cabinet level departments, principally the Departments of the Interior, Agriculture and Defense.

The Department of the Interior (DOI) is the main cabinet level body in charge of the nation's water resources. Within the DOI, the U.S. Geological Survey (USGS) is responsible for financing water resources research, prepares technical reports on water management practices and techniques, and monitors and collects data. The Bureau of Reclamation is also within the DOI and is responsible for monitoring and developing appropriate irrigation and agricultural land reclamation projects in the western states (Dzurik 2003).

The Department of Agriculture handles water resource planning and development through the NRCS, Forest Service, Agricultural Research Service and Economic Research Service.

The NRCS is the most active of these agencies with regard to irrigation and flood control (Dzurik 2003).

The U.S Army Corps of Engineers (COE), under the Department of Defense (DOD) is the nation's oldest water resource agency and functions primarily as a civilian federal agency and deals mainly with water resources through the construction and maintenance of physical structures located on the navigable waters of the United States (Dzurik 2003).

The EPA is the foremost federal agency with respect to water quality. It administers the CWA and has major responsibilities in pollution control enforcement, funding and managing municipal sewage treatment plants as well as permit programs dealing with stormwater runoff (Dzurik 2003).

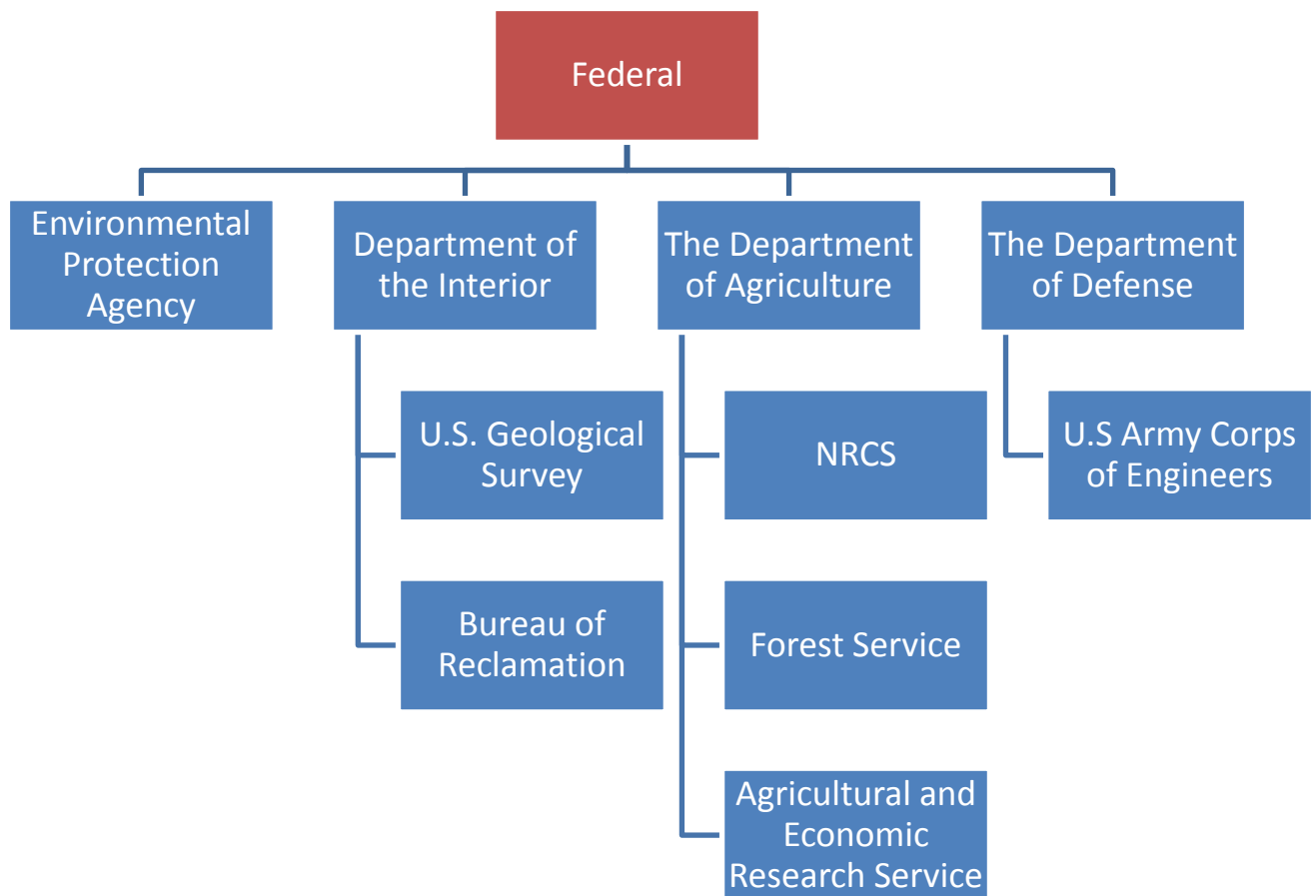
Water agency structure on the state level varies between different states. According to Cech (2005), levels of statewide involvement in water resource planning can include the administration of water quality programs, flood protection, drought planning, water allocation, and conservation efforts. The political clout differs between the states, where some agencies wield considerable clout while others provide only an advisory level of service.

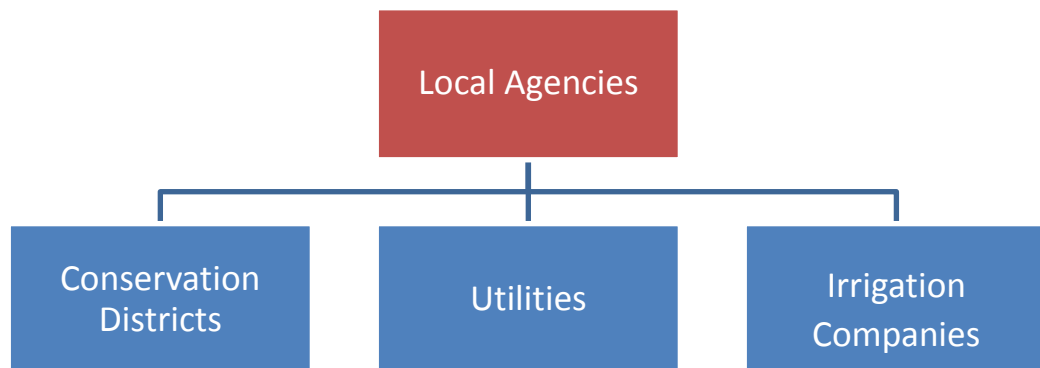
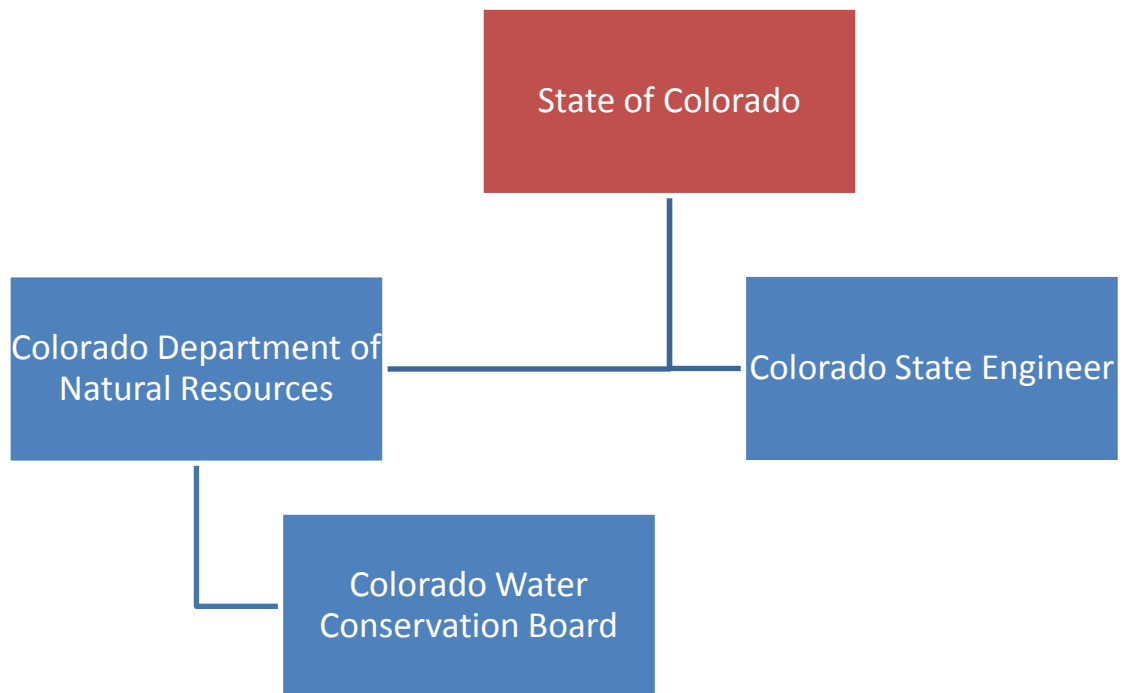
Conservancy or conservation districts are regional political subdivisions of the state formed by local landowners to solve local water management problems. They are generally created to develop water supply and flood control projects. These districts provide multiple services and often conform to local watershed boundaries. Conservation districts are managed by a staff of employees and are directed by a board. Board members are either elected by local landowners or appointed by a district county judge (Cech 2005).

Mutual ditch and irrigation companies are privately owned water stock companies organized to deliver irrigation water to shareholders (Cech 2005). The 1920 U.S. Irrigation Census describes these water companies as:

The most common form of organization for cooperative irrigation enterprises... Water is apportioned on the basis of stock ownership, and the cost of annual operation and maintenance is raised by assessments on the stock... stock may be owned independent of land ownership , and it may be and is at times, rented, the lessee receiving the water apportioned to the stock rented.

## Water Agency Hierarchy





## **Project Update-April 2012**

Ann Oliver was hired to finalize the Beaver- Willis Diversion project. The Bolen Ditch Company chose not to pursue NRCS approval or funding due to lack of ditch company funds and therefore they could not utilize the awarded monies from the CWCB's Watershed Restoration Program. Consequently, the CWCB allowed the Beaver and Willis to share those funds. Of the \$ 19,900 amount, \$14,400 was allocated to construction and approximately \$5,000 was budgeted for project administration.

The projected long term benefits to the Mancos River from the completion of this project are passage of high flows, increased channel bed and bank stability in the vicinity of each diversion, reduced bank erosion, increased fish movement past these diversions, and increased use of deep water habitat (pools) by trout and native fish. The projected long term benefits to irrigators from the completion of this project are the ability to clean diversion channels through use of newly installed sluice gates, and the ability to divert the full water right associated with each ditch, when available, with reduced maintenance costs.

Ann Oliver and Russell Klatt are currently working on other grants to continue the progress of river health improvement as outlined in the Watershed Plan. The next diversions will be addressed in fall of 2012, after irrigation season has completed and grant funding is obtained. Besides funding for the diversions, MCD is looking for funding a Watershed Coordinator and will be applying for grants to fund this position.

**Appendix A:**

**Mancos Conservation District Board Meeting Minutes**



**MINUTES OF THE MONTHLY MEETING  
OF THE MANCOS CONSERVATION DISTRICT  
March 8, 2011**

The meeting was called to order. Those present included Bob Becker, Russell Klatt, Steve Hawkins, Laurel Barton, Eldon Simmons, Lea Cody, Carmen Ogdeno, Isabel Stroh, Mark Oliver, Wally Patcheck, Mike Rich, Nakayla Lestina and Terry Moores. Steve Jackson and Dick White were not present.

Minutes: A motion was made by Bob Becker and seconded by Steve Hawkins that the minutes be accepted as presented. The motion passed.

Financial Statement: A motion was made by Bob Becker and seconded by Terry Moores that the financial statement be accepted as presented. The motion passed.

Mancos River Diversion Report: Mark reported that Amy Beatie is working on her part and should be finishing soon. He asked the board if the \$2,000 that was given to the board by the County Commissioners could be billed for design. The board agreed to pay the \$2,000 when Mark billed for it. Work is progressing.

Laurel Barton reported her activities (see attached report) and also provided a revised budget for the board to review. Bob Becker made a motion seconded by Steve Hawkins that the board provides \$500 cash match if needed for the project. The motion passed. Laurel also asked to have Megan Tallmadge work on the project in the Dolores area. The board approved the request asking Megan to attend the next meeting.

NRCS Update: Mike reported there are 3 high tunnel contracts in Mancos, 2 salinity contracts, 1 forestry contract and 1 wildlife contract. Salinity sign up has been extended to May 17, 2011. Mike presented the board with log on information for the weather station. He introduced Nakayla Lestina to the board who made a presentation for herself and request that the board pay ½ of the cost of Camp Rocky. Steve Hawkins made a motion that was seconded by Bob Becker that the board pays the \$150 and also the balance of \$150 if Nakalya was not able to get funding for the balance. The motion passed.

Project Status Report: Please see written report. Russell updated the board on ongoing projects and new possible starts. He is also working on ideas for sign ups. He met with the Forest Service regarding the work done on the Sudden Aspen Decline and if funding can be obtained; there is work to be done in this area.

Revenue Generating Report: Terry reported that tree orders are still coming in. Inventory is being sold out, so we have to check that before ordering. Orders

being taken through March 31. We doubled our orders this year and trees are due to be delivered approximately April 16.

Subdivision: No requests for permit for that needed the board's attention.

Echo Basin: No report. All is quiet.

Annual Meeting: The board discussed options for the meeting and possible dates. Food to be handled by Eldon through Pete at the P & D, April 8 and April 15 are possibilities. Will use the community center.

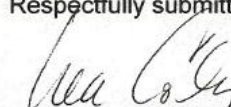
Arbor Day: The board was approached by the 4<sup>th</sup> Grade Foresters to be sponsors for the Mancos 4<sup>th</sup> graders for Arbor Day. The cost would approximately \$60 and all 4<sup>th</sup> graders would receive a tree, planting instructions, a certificate, etc. The board elected to do this donation.

Carmen Ogdeno: Carmen introduced herself to the board as an intern from NAU working on her thesis. She presented the board with a proposal (see attached) and is willing to work for the next year developing a plan and writing grants to help further the Diversion Project and any other project the board is interested in pursuing.

Bills: Steve Hawkins made a motion seconded by Bob Becker that the bills be paid as presented. The motion passed.

Next meeting date: Tuesday, April 12, 2011 at 4:00 pm – board office.

Respectfully submitted,



Lea Cody, District Manager  
Mancos Conservation District



**MINUTES OF THE MONTHLY MEETING  
OF THE MANCOS CONSERVATION DISTRICT  
JUNE 14, 2011**

The meeting was called to order. Those present included Bob Becker, Carmen Ogden, Eldon Simmons, Lea Cody, Courtney Iuppa; NRCS student intern, Nancy Babbs from the Willis Ditch, Steve Hawkins, Dick White, Terry Moores, Wally Patchek and Mark Oliver. Russell Klatt and Laurel Barton were on vacation.

Minutes: A motion was made by Bob Becker and seconded by Steve Hawkins that the minutes be accepted as presented. The motion passed.

Financial Statement: A motion was made by Bob Becker and seconded by Dick White that the financial statement be accepted as presented. The motion passed.

Mancos Diversion Report – Mark Oliver reported that he had meetings with the Willis Ditch Co regarding their design. The heading needs to be moved and re-designed. Rod Clark will be doing the design approval himself which should save time and hoping to be ready for October construction. The Bolen Ditch design should be ready soon.

Carmen Ogden put together all the watershed reports she used in writing the Happy Rivers Grant on a thumb drive for the boards use and Lea printed copies and put into binders to keep in the office. The grant she wrote was for \$8,500 in planning for the Bolen Ditch and \$19,512 for construction on the Beaver, Bolen and Willis ditches. We won't hear until September. Her next step is to apply to the Walton Foundation as they are big into fresh water quality, river habitation and all things along the line of the conservation districts goals. She needs input from the board members to put together a letter of inquiry. If we get a favorable response, she will write the grant. Funds are given year round, so it will be a good source to apply to.

School to Farm: Laurel is on vacation, but a written report is attached.

NRCS Update: Mike introduced Courtney Iuppa, a summer intern. The office is wrapping up EQIP contracts for Mancos and there are five final contracts totaling approx. \$75,000. Still waiting to hear on BSP funding. The Root and Ratliff ditch is considering some work that would be run through BSP. State Conservationist Allen Green is retiring in July.

Project Status Report: Russell on vacation – no report.

Revenue Generating Report: No report.

Subdivision: No requests for permit for that needed the board's attention.

Echo Basin: Water reporting spreadsheet came to Lea from Brian at the Division of Water Resources. See attached copy. There have been no new releases as we are still running on free water – no call on the river yet.

SAD Grant Reporting – Heather Day is the contact Lea has been working with between Felicity and the Forest Service. The SAD Reporting is done, but the Stewardship Grant is not complete yet. Lea will continue to follow up.

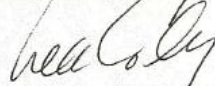
Camp Rocky: Bob Becker made a motion seconded by Dick White that the board offers funding of \$900 or 3 scholarships, to students wishing to attend Camp Rocky, even if they are not in our district. The motion passed.

Hoch Grant: Mr. Hoch sold a majority of his property, but still owns the section of land that the grant is to be used on. The Corp of Engineers appears to be cooperating on getting a permit completed and the NRCS should be hearing soon on that so they can move forward.

Bills: Dick White made a motion seconded by Eldon Simmons that the bills be paid as presented. The motion passed.

Next meeting date: Tuesday, July 12, 2011 at 4:00 pm – board office.

Respectfully submitted,



Lea Cody, District Manager,  
Mancos Conservation District

**Appendix B:**  
**Mancos Proposal**

## **Mancos Conservation District Proposal**

### ***March 2011***

**To:** Mancos Conservation District Board of Directors and other interested stakeholders

**Subject:**

To provide the water users of the Mancos River Watershed with potential financial, technical and educational opportunities to aid conservation efforts by developing a project of identifying needs, making a plan, finding potential funding sources, implementing projects, and follow-through as the subject of a practicum/thesis for Carmen Ogden, graduate student at Northern Arizona University, pursuing a MS degree in Applied Geospatial Sciences.

**Problem Statement:**

Human requirements for development of water delivery systems in agricultural production have led to the desire of the Mancos Community to find more efficient and less environmentally evasive methods of providing adequate quantities of good quality water to landowners and managers of the region. In order to achieve conservation goals of improving water delivery systems while maintaining environmental integrity, grant funding must be found.

**Introduction:**

Mancos, Colorado is a Statutory Town in Montezuma County, located in southwestern corner near the Four Corners. The population was 1,119 at the 2000 census. The Town was founded in 1894, near the site where early Spanish explorers first crossed the Mancos River. Originally laid out as a railroad town, Mancos stretches for approximately a mile along the river and on both sides of it, while newer areas lie north of the old railroad alignment. The Mancos River flows from east to west through the town, and then flows to the south into Mancos Canyon, on the west and south toe of the Mesa Verde.

Local farmers and ranchers began constructing irrigation canals to bring water from the Mancos River to cropland and pasture in various parts of the Mancos Valley in the late 1870s and 1880s, and by the beginning of the 20th century a large network of irrigation ditches and laterals began operating. In recent years, a large project, the Mancos Valley Salinity Control Project was funded by various sources, including the US Bureau of Reclamation, US Natural Resources Conservation Service, and local irrigation and water companies and districts. The project includes replacing many open irrigation ditches with piping to conserve water and prevent salt contamination from infiltration and evaporation of irrigation water. This project as well as many others not only benefits the local area, they would also benefit the greater region as the Mancos River is a tributary of the San Juan River which in turn is a tributary of the Upper Colorado River.

Due to the financial constraints of watershed management in rural Colorado, finding outside sources of funding is imperative. Protecting existing farmland and watersheds are critical to the region's economy and stability, as well as the environmental benefits of open space, food and cover for wildlife, flood control and the aesthetic value of natural resources.

**Proposal:**

I propose to help identify projects relevant to the mission of the Mancos Conservation District, to aid in the process of finding funding sources for these projects, applying for funding, implementing and following through with the projects. In the course of this process, I intend on using the research and processes involved with this project as the subject for my practicum/thesis.

At a minimum, the results of this process will be:

- A. A plan document summarizing the information compiled during this process
- B. Identification of resources and programs that may be employed to positively impact identified conditions
- C. A better understanding of the issues and possibilities for the District
- D. Better outreach with expansion of information available through the website

**Project Description:**

## 1. Compile information for plan

- A. History of the Mancos Conservation District
- B. Good Map & photos
- C. Prior and current watershed projects
- D. Goals and wish list
- E. Current Resources
- F. Potential Funding sources and other resources
  - Property owners
  - Federal or Local government
  - Private Foundations
  - Local businesses
  - Local schools and organizations

## 2. Show needs

- A. Decrease salinity
- B. Water conservation
- C. Sustainability

## 3. Identify partners

- A. Dolores Conservation District
- B. Local Agencies or businesses

## 3. Identify potential match funding

- A. In kind services (i.e. administration or engineering)
- B. Volunteer labor
- C. Cash

**Timeline:**

March 2011 – August 2011

- Compilation of data and execution of project

Spring 2012

- Final practicum write-up

**Grad Committee:****Dr. Alan Lew**

**Ph.D., AICP, Professor** (B.A., University of Hawaii, Hilo; M.A., M.U.P., Ph.D., University of Oregon 1986) Tourism studies, Urban planning, East and Southeast Asia, Social media, Distance education; Editor-in-chief, *Tourism Geographies* journal; **Graduate Program Coordinator** for the M.S. Applied Geospatial Sciences, Graduate GIS Certificate, and Community Planning emphasis in the Master of Administration degree. NAU since 1986.

**Dr. Dawn Hawley**

**Ph.D., Professor** ,B.A., Baylor University; M.A., University of Nebraska, Omaha; Ph.D., Arizona State University 1994) Public Land Policy, Economic Geography, Urban Geography, GIS. NAU since 1991.

**Dr. Aregai Tecle**

**Ph.D., Professor**, B.A., Anderson University, 1971 M.S., Ball State University, 1979 M.S., University of Arizona, 1986, Ph.D., University of Arizona, 1988

Post doctoral:

1988 Research Associate, University of Arizona

1995-1996, Visiting Associate Professor, Stanford University

Hydrology and Systems Analysis. Modeling hydrological processes, multi-criterion decision making, conflict resolution in multiresource management, integrated forest resource systems analysis, analysis of water quality programs.



**Appendix C:**  
**Healthy Rivers Grant Application**

## **COLORADO HEALTHY RIVERS FUND GRANT APPLICATION Revised February 2010**

The information below is a brief summary of what must be included in an application for funding from the Colorado Healthy Rivers Fund. Proposals shall address all sections listed below. Please refer to the Colorado Healthy Rivers Fund (CHRF) Program Guidance document for complete descriptions and requirements for grant application. The proposals shall be no longer than 7 pages (*minimum 11 point font and 1 inch margins*), not including attachments (e.g. maps).

### **SUBMITTAL INFORMATION**

- **Completed applications are due by April 30 (close of business).**
- **All applications should be submitted electronically via email to [chris.sturm@state.co.us](mailto:chris.sturm@state.co.us)**  
**The entire application must be submitted as one file, e.g. word doc or pdf. Please note that files larger than 7 mb cannot be received via email.**
- Electronic applications on CD or DVD may be mailed to:**  
**Colorado Water Conservation Board, ATTN: Chris Sturm**  
**1313 Sherman St., Room 721**  
**Denver, Co 80203**
- **Logistical questions about submitting application packets should be directed to Chris Sturm (303-866-3441, ext. 3236 or [chris.sturm@state.co.us](mailto:chris.sturm@state.co.us)).**
- **Please indicate whether the application is for a Planning or Project Grant.**

### **GRANT CATEGORIES**

Two categories of grants will be available under the Colorado Healthy Rivers Fund program: (1) Project Grants, and (2) Planning Grants. Recognizing that good planning is a critical aspect of any project, the goal of the Commission and Board is the implementation of on-the-ground projects to restore and protect the lands and natural resources within Colorado watersheds.

#### Project Grants

These grants will support projects that promote the improvement and/or protection of the condition of the watershed. This could include projects such as water quality and/or water quantity monitoring, participation in the development and/or implementation of total maximum daily loads (TMDLs), implementation of watershed-related best management practices, flood protection, channel stability, and a wide variety of other riparian, streambank and habitat restoration efforts. Watershed restoration or protection projects can be very costly, and this grant can be used as matching money for larger grants or grants that need nonfederal match. Grants can be used in multi-objective projects when multiple partners and funding sources need to be managed. The suggested maximum for this grant type is \$50,000.

Colorado Healthy Rivers Fund Grant Application

### Planning Grants

Development and implementation of a successful watershed restoration or protection project requires appropriate planning. This second category of grants will support these planning efforts. Such efforts may include data collection and assessment, analysis of project alternatives, project permitting, acquisition of funding for a project, and outreach efforts to ensure the education, involvement and support of the local community. The suggested maximum amount for this type of grant is \$25,000.

#### **1.0 PROJECT PROPOSAL SUMMARY SHEET**

**Please list the following on the summary sheet:**

Project Title

Project Location (include Lat/Long if applicable)

Grant Type (planning or project)

Grant Request/Amount

Cash Match Funding

In-kind Match Funding

Project Sponsor(s) (identify the fiscal agent if different from project sponsor)

Contact Person name, email address, and phone number

Brief Description of the Project

All of the above information should fit on one page. Please use a font size no smaller than 11 point.

#### **2.0 – 3.0 APPLICATION EVALUATION CRITERIA**

The application will be evaluated with respect to the following three factors:

- How *well* does the applicant fit the qualifications test? (*Applicant Qualifications*)
- Does the applicant organization have the capability to *accomplish* the proposed work? (*Organizational Capability*)
- How effective is the proposal at accomplishing the legislative intent of “restoration and protection of land and natural resources within the watersheds in Colorado”? (*Effectiveness of Proposal*)

The goal of the application is to demonstrate that the applicant is qualified to manage the grant and organized effectively to implement the project. The overall effectiveness of the project in preserving and protecting the natural resources in the watershed is rated heaviest.

The degree to which an application meets the above three evaluation factors will be determined by utilizing the rating system shown on the table included at the end of the application, entitled “Colorado Healthy Rivers Fund Application Evaluation Criteria”.

Colorado Healthy Rivers Fund Grant Application

## **2.0 APPLICANT QUALIFICATIONS**

2.1 Identify the lead project sponsor and all cooperators. Describe the project responsibilities of each cooperator. Examples might include technical assistance, deliverable review, cash contributor, labor, volunteer coordination, etc.

Does the application represent diverse interests engaged in collaborative approaches? Is participation open to all interested parties, and is the application supported by relevant local, state, and federal agencies?

2.2 What is the organization's history of working cooperatively in partnership with other community organizations, watershed groups and local, state, and federal government?

2.3 What information is the project sponsor using to develop the proposed plan or project?

Include any relevant information regarding existing watershed plans, geomorphic assessments, water quality and/or water quantity monitoring, flood studies, riparian conditions assessments, aquatic/terrestrial habitat conditions, wildlife studies, and river restoration reports.

2.4 Specify in-kind services or cash contribution (match) amount for the activities proposed. Include the sources of additional cash funding. The applicant must provide at least 20% in-kind or cash match. Project applications require a cash match.

## **3.0 ORGANIZATIONAL CAPABILITY**

3.1 What is the applicant organization's history of accomplishments in the watershed? Describe work performed within the watershed, e.g. stream restoration, water quality monitoring, volunteer/membership recruitment.

3.2 What level of staffing will be directed toward the implementation of the proposed project/planning effort? Please discuss the number of staff and amount of time dedicated for the project.

3.3 How capable is the available staff of accomplishing the proposed project/planning effort. Please list names, brief resumes, and a description of the work they will perform (please limit to 5 lines per person).

3.4 Will the applicant organization utilize community volunteers in the project? If so, how many and in what capacities?

## **4.0 EFFECTIVENESS OF PROPOSAL**

4.1 Provide a brief description of the watershed and the issues in the watershed as they relate to the project. Describe the objectives of the project and how the project will measure success of the objectives.

4.2 Describe how the project will improve the overall health of the watershed or improve the strength of the organization to accomplish future projects.

Colorado Healthy Rivers Fund Grant Application

- 4.3 Discuss the budget, the schedule, and deliverables for the proposed project and demonstrate that they are realistic. Progress reports are due six months after the notice to proceed. Final reports are due after 1 year, with an option to extend by another six months.
- 4.4 Discuss the multi-objective aspects of the project and how they relate to each other. Describe similar activities in the watershed and how this project complements but does not duplicate those activities.

## **5.0 EVALUATION AND MONITORING PLAN**

- 5.1 Describe storage, management and reporting of project data.
- 5.2 Describe any scientific models used as part of the project or state that no models will be used.
- 5.3 Describe the organization's proposed monitoring plan for measuring the long-term performance of the project
- 5.4 Describe long-term funding plans for operation and maintenance of restoration activities and for ongoing monitoring, if any.

<b>6.0 BUDGET</b> - Present the project budget in tabular format. Include rows for each task and columns for requested CHRF funding, other funding, and in-kind match. TASK	CHRF Funding	Other Funding 1	Other Funding 2	In-Kind Funding	Total
Task 1					
Task 2					
Task 3					

## **Appendix D:**

### **Walton Letter of Inquiry**

August 8, 2011

The Walton Family Foundation  
 ATTN: Letter of Inquiry  
 919 18th Street, NW, Suite 650  
 Washington, DC 20006

Dear Walton Family Foundation,

Mancos, Colorado is a Statutory Town in Montezuma County, located in southwestern corner near the Four Corners. The population was 1,119 at the 2000 census. The Town was founded in 1894, near the site where early Spanish explorers first crossed the Mancos River. Originally laid out as a railroad town, Mancos stretches for approximately a mile along the river and on both sides of it, while newer areas lie north of the old railroad alignment. The Mancos River flows from east to west through the town, and then flows to the south into Mancos Canyon, on the west and south toe of the Mesa Verde. The Mancos River is a tributary of the San Juan River which in turn is a tributary of the Upper Colorado River.

The Mancos Valley Watershed Group was formed in 2006 and has brought together riverfront landowners, farmers, ranchers, environmentalists, irrigation companies, recreationalists and concerned members of the community to address issues facing the watershed group. In order to achieve conservation goals of improving water delivery systems while maintaining environmental integrity, several studies of the watershed have been conducted including a Rapid Assessment prepared by the NRCS and a Functional Assessment by Peter Stacey from the University of New Mexico. Based on the findings from these reports, a draft Watershed Plan and Source Water Protection Plan for the watershed have been completed.

#### **Diversion Project Overview:**

Some pieces of critical importance emerged from the studies initiated by the Watershed Group. First and foremost, a need to continue upgrading aging, 19<sup>th</sup> century-vintage irrigation infrastructure that is taking its toll on the Mancos River including: degradation of the river channel, inefficient and poorly measured water delivery, and frustrated irrigators unable to afford ongoing maintenance. A major portion of this degradation occurs at ditch diversion sites. Long-term goals for our watershed management and protection plan are to work with irrigators/irrigation companies and landowners along the Mancos River to restore the capacities of the river system. This can be done by taking a holistic approach to the above described situations. The aging diversion structures have been examined by a team of experts (engineers, water commissioner, ditch owners, and an ecologist) working together to consider all possibilities of reform, restoration and irrigation efficiency improvement.

Multiple diversions have been identified that are dysfunctional – they require continued yearly maintenance in the form of equipment getting into the stream and moving cobbles and gravels around to get water into the head gate. Disruption of the streambed kills aquatic and invertebrate life at the site, delivers sediment downstream smothering fish eggs and aquatic life, destroys riparian vegetation and can cause down-cutting of the streambed to the point to which water can no longer enter the head

gate structure over time. In addition some diversion sites have been so worked over the years that a 5-6 foot waterfall drops off just downstream from the heading. This hydraulic drop results in an inadequate withdrawal of water through the head gate, as well as the creation of a fish passage barrier along the river.

**Diversion Project Objectives:**

1. Stabilize the river bed and banks at ditch company points of diversion by:
  - a. Placing permanent structures in the river to preserve the present channel bed elevation and eliminate the need for temporary dams.
  - b. Helping the river remain in its present channel and establish proper water depth at the diversion inlet.
  - c. Installing channel and bank friendly structures to protect the banks during high flows and to maintain channel bed stability.
  - d. Designing in-channel structures that do not impede bedload transport.
  - e. Reduce maintenance of the diversion structure and improve diversion efficiency which will result in more water in the downstream channel.
2. Maintain flood plain capacity to pass floodwaters with minimal scouring of vegetation and soils.
3. Install gated structures where necessary to control water entering inlet channel.
4. Discourage braiding of river channel above and below point of diversions.
5. Encourage healthy riparian habitat in the vicinity of the point of diversion.
6. Contribute to the restoration of a sustainable fish population in the river below the town of Mancos by constructing in-channel structures that are not fish barriers.
7. Integrate project into flood control planning with Mancos Conservation District and river bottom landowners.

**Relevance to Walton Foundation Funding Area and Initiative:**

The Mancos Diversion Project fits the criteria of Conservation Goals and Investment Strategies as outlined by the Foundation because outcomes of the project will contribute to a healthy river system by improving river flows, water quality, riparian habitat and built infrastructure of a Colorado River tributary.

**Estimate of Needed Funding:**

Needed funding for this project is estimated at \$140,000.



Due to the financial constraints of watershed management in rural Colorado, finding outside sources of funding is imperative. Protecting existing farmland and watersheds are critical to the region's economy and stability, as well as the environmental benefits of open space, food and cover for wildlife, flood control and the aesthetic value of natural resources.

Please accept this letter of inquiry. For questions or response to this letter please contact:

Eldon Simmons, President, Mancos Conservation District - [rafterkbar@hotmail.com](mailto:rafterkbar@hotmail.com)

Lea Cody, Secretary- [leacody.mancoscd@gmail.com](mailto:leacody.mancoscd@gmail.com)

Russell Klatt, Conservation Technician - [russell.klatt@co.nacdnet.net](mailto:russell.klatt@co.nacdnet.net)

**Appendix E:**

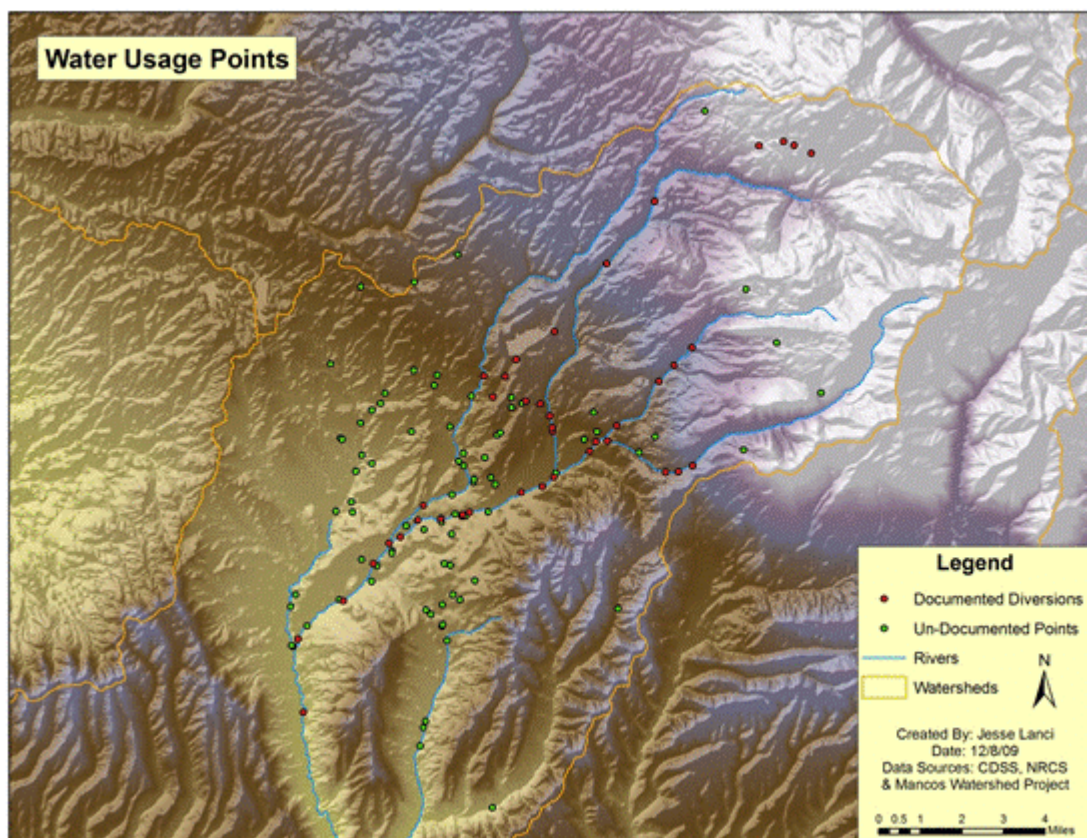
**Mancos Watershed Plan**

**Prioritized Diversion Structures**

## Mancos Watershed Plan

### Prioritized Diversion Structures

Below is a list of 12 diversion structures out of over 50 structures that were inventoried. Based on observations of head-cutting, bank-cutting drying of surrounding riparian area, and obstruction of fish passage, these 12 structures were prioritized as having some of the greatest amount of impact to the functioning capacity of the river and are in a place where they could do the most to benefit the river if repaired properly.



**Figure 1. Inventoried diversion structures. Red dots are those that were documented with photos, location, descriptions, and problems associated with the diversions. Prioritized diversions for repairing are illustrated below.**

## **Carpenter Mitchell Diversion**

### Mancos

Overview: Owner wants to be notified if there is ever any work being done on the diversion. Relatively new system that involves a weir set up that pipes water.

Barrier: The barrier stops the entire river; only water available is from the trickle the wooden board can't stop. Barrier in use currently drops about 3 feet into a pocket with large boulders; the old barrier is still visible below the boulders. I don't see how fish passage is possible. The exit pipe drops water onto a concrete slab that is about 1 – 2 feet high out of the water.

Head Gate & Ditch: This is a new weir that pipes the water.

River: Below the diversion, the channel has about 10 foot banks. The water is very slow moving above the diversion. The creek makes several turns above the diversion and crosses several properties.

Access: Diversion is right off of highway, once through the gate; one would be able to drive right to the weir and diversion barrier.

Other: N/A

Decreed Rate Total: 11.24 CFS



## Field Diversion

### West Mancos

Overview: Looks to be an older diversion.

Barrier: The barrier spans the entire river, looks to be hard for fish passage. The barrier is composed of logs, rocks and concrete; there is a decent sized pool above the barrier. There are two logs below the barrier, possibly for stabilization. Part of the wall on the diversion itself is held up by cables. There exists about 3-4 feet in elevation difference at the barrier.

Head Gate & Ditch: No water is running in the ditch; gate may be closed or debris may be causing a blockage.

River: Above the diversion, the banks are similar to the Town of Mancos diversion, overall mellow with a rock wall on the left side. Below the diversion, the banks are becoming steeper.

Access: Access is really easy; there is a road that brings you right to the diversion.

Other: N/A

Decreed Rate Total: 0.91 CFS





## Glassglow & Brewer Diversion

### Mancos

Overview: Newly worked on by the NRCS.

Barrier: The barrier is small, made up of sand bags; it allows fish passage and creates a small pool above it (minnows are noted below the diversion). There are five large tires in the diversion area; 3 above the diversion (probably for bank stabilization) and the other 2 are at the 1<sup>st</sup> gate (probably also for stabilization).

Head Gate & Ditch: The 1<sup>st</sup> gate is below the water level. There is also evidence of the old diversion system, which consists of a very big block of concrete (sitting next to the new diversion). There are two gates, one right on the river and 1 about 25 yards down just before the water is piped (new concrete structure); there is a large still pool in between (exposed to cattle).

River: Diversion is located in a heavy cattle area; there is little vegetation along the banks, along with looser soil due to cattle. The river is at a constant gradient; with a cobble bottom, small rapids and pools.

Access: This diversion is easily accessed by passing through some gates and being able to drive and park right at the diversion. I am not sure who owns the ranch.

Other: Fencing around the structure and riparian area, have the ability to keep the cattle out.

Decreed Rate Total: 6.73 CFS



## Graybeal Diversion

## Mancos

Overview: N/A

Barrier: The diversion barrier looks to be made up of half trash; other than large logs (held in by cables and metal pipes) and small to medium sized river rocks; it's also composed of concrete chunks (with rebar in it), excelsior rolls; carpeting and a bunch of orange plastic twine (I'm not sure what this originally was). The barrier pushed the low flowing river all to the left; once passed by the barrier, it drops about three feet. If fish could survive in this river (due to water quality), they would have a difficult time passing the barrier.

Head Gate & Ditch: There is no water flowing in the ditch. I am told by Walley and Marty that the gate needs to be replaced, the wheel does not turn and the gate will not open.

River: The surrounding terrain is rather flat, but the left bank above the diversion drops about 2-3 feet (may be less of a cut-bank due to the large cottonwoods); the banks (on both sides) only deepen and steepen below the diversion. The river gradient is fairly mellow, it looks to mainly have low angle drops in between very small little pools, and the current is slow looking. There is a lot of scattered concrete below the diversion (probably from the run-off), it looks to have come from the diversion barrier, just washed down by high run-off.

Access: There is a road that can bring you right near the diversion; you'd have to pass through a barb wire gate in the beginning. For parking, you could park on that road, or there is a possibility one could park closer on a hay field.

Other: N/A

Decreed Rate Total: 2.75 CFS



## **Lee Diversion**

Overview: N/A

Barrier: The biggest thing is that the manager of the diversion opens and closes the diversion every year; he opens (with heavy machinery) anytime after run-off (sometime as late as June, July and even August). He then pushes the barrier to block off the ditch opening after he is though with irrigation for the year. Jerry tells me the ditch has gotten larger and that the left bank (across and above from the diversion point) has become steeper. When the barrier is opened up, I'm told that it spans  $\frac{3}{4}$ ths the river and almost all of the water flows into the diversion, fish passage is blocked and diversion manager says he has a #1 priority and can take all the water, also says river is unregulated.

Head Gate & Ditch: On the ditch itself, there is a blockage (very similar to what's done on the diversion barrier) that is supposedly to prevent any excess water from passing further through the diversion. That excess water has an exit channel that has to travel up-hill (not much of a channel), creating a muddy bog-like area. At the gate the water looks to come in with such force that it's undercutting the concrete gate structure. There is also a very deep channel in the 2<sup>nd</sup> excess channel below the gate. This in places is blocked, causing excess water to flood onto the property.

River: I has been observed that the river is changing courses and has moved its channel more to the left below the diversion (about 50 – 100 yards), thus creating a very large cut-bank; which has concrete and pipe (used for culverts) to try and help with stabilization. The banks are shallow, only 1 or 2 cut-banks with a height of about 2-3 feet (this of course is excluding the very large cut-bank farther down-stream), mostly composed of medium round-river rocks. Gradient is very constant; there is very easy access to both sides of the river.

Decreed Rate Total: 12.476 CFS



**Ratliff & Root along with the Smith Diversion**

Mancos



Overview: There are two ditches that feed off of one diversion barrier; the Smith ditch and the Ratliff & Root ditch.

Barrier: The barrier consists of a small rock wall that spans the entire river. Though it diverts most of the water, some still trickles through; there is evidence of tarp use. It's probably safe to say they have to re-build the barrier every year. There is no elevation drop age before and after the barrier. Fish passage can probably only happen at higher water levels.

Head Gate & Ditch: There is a large concrete structure above the two head gates that has two gates without wheels; I assume this is to stop water from flowing into the pool. Below this concrete structure is a large pool with a large exit channel and the two head gates (this channel and two gates are part of the same concrete structure).

River: The river looks to be at a fairly constant gradient, with no sharp turns and has minor cut-banks.

Other: N/A

Decreed Rate Total : Ratliff & Root: 42.514 CFS

Smith: 1.75 CFS



## Sheeks Diversion

### Mancos

Overview: A new diversion system.

Barrier: Diversion has a nice concrete construction. Diversion wall is composed of rock, concrete and some metal pieces; it diverts all the water and only has some trickling through the barrier. This barrier does not allow for fish passage, but I did notice 1 or 2 minnows above the diversion. The elevation difference between the diversion pool and the running water below the barrier is about 4 feet.

Head Gate & Ditch: Puts the water into a piped system.

River: The channel is in a low grade above and below the barrier. The banks are not very steep above the barrier, but are about 4-5 feet below. There are deer, cow and other sign (possibly beaver or otter tracks) along the creek.

Other: N/A

Decreed Rate Total: 13.536 CFS



## **Smouse Diversion**

East Mancos

Overview: N/A

Barrier: It is a small and thin diversion barrier; it allows water to pass through, and is made out of medium sized river rocks. I have found two shovels (pictured) indicating to me that is how they improve their barrier.

Head Gate & Ditch: No water running through the ditch. I have found no head-gate.

River: The gradient is fairly gentle; there are steep banks, the river right side above the diversion is a cut-bank and is “sloughing” off. The vegetation around the diversion is rather thick.

Access: The access to the diversion looks to be for foot traffic only. The diversion lies within the Forest Service boundary.

Other: N/A

Decreed Rate Total: 3 CFS



## **Veits/Boss/Number 6 Diversion**

Mancos

Overview: N/A

Barrier: Diversion takes most water from the river. The barrier is made up of medium to small river rocks; it expands all the way across the river. It does seem possible for fish to travel up the uppermost exit channel of the diverted water.

Head Gate & Ditch: Before the water reaches the weir, most of the water is diverted from the diversion channel, being put back into the original river channel. This “gap” is about 30 yards long. The water has what looks to be two exit points, one just above the weir and one that separates the water in the weir. The diversion channel has a fairly fast flow.

River: The area has a gentle gradient even below the diversion barrier. Just up-stream of the diversion is a low fence that is just a few inches above the water. Just below the barrier 2 channels form (creating an island) both are very small.

Access: There is a road that takes you right to the gated weir. You have to walk a short distance to the diversion barrier. I’m not sure who owns the land; everything is right behind the Excelsior Plant.

Other: N/A

Decreed Rate Total: 17.264 CFS (Decreed rates for Veits and Number 6 added together; Boss is recorded as abandoned)





## Webber Diversion

### Mancos

Overview: This is one of the larger diversions in the valley located right below the confluence of the West and East Mancos rivers.

Barrier: The barrier consists of 2 tiers of rebar cages (filled with river rock) totaling about 8 – 10 feet of elevation change. There is also a river rock pile that helps to direct the flow into the ditch (created by machinery every year). Fish passage would be impossible.

Head Gate & Ditch: There is a pool about 2-3 feet deep and about 50 yards long (fish were noted in this pool). The pool has 2 exit channels, both walled up with pieces of lumber/wood; the pooled up water flows over both wooden barriers (both drop about 2 feet) into a small channel (which drops another 2 feet) and finally into the channel. The head-gate is made of wood, with open slots; this means that there is no way of completely shutting off the water with the gate alone, it's always flowing.

River: The streams gradient is not constant; there are pools, low angle rapids and high angle rapids (could be from human impacts). There are cut-banks above the diversion (ranging around 2-4 feet) but there are also gentle slopes. Below the diversion the banks reach anywhere between 10 – 12 feet in height; they are mainly steeply angled. There is a lot of river bed and cobble bar disturbance from heavy machinery.

Other: N/A

Decreed Rate Total: 52.064 CFS



## **Williams Diversion**

### East Mancos

Overview: N/A

Barrier: The barrier consists of medium to small rocks, metal pipes (the type that would be used for culverts), excelsior rolls, hay bails, wood piles (possibly from run-off) and tree trunks (most likely placed there). From the top of the barrier to about the bottom is about 8 feet tall.

Head Gate & Ditch: Both look to be functioning just fine.

River: East Mancos has a fine silty white/turquoise precipitate on the bottom of the pool created by the diversion barrier; the surrounding rocks also have a whitish ting to them. On the river right side, the hill slope seems to be “sloughing” off just above the barrier. Below the barrier the river channelises and becomes steeply embanked, at points about 9 to 10 feet.

Access: Access to the diversion is following a Forest Service road that’s rough (especially at the end – fairly steep too) that’s about 1.25 miles long. The diversion lies on Forest Service property.

Other: There are also excelsior rolls that look as if they’re placed as if their trying to slow down high flows.

Decreed Rate Total: 5 CFS



## **Willis Diversion**

### Mancos

Overview: This is one of the three diversions that Marty and Walley say should be a priority.

Barrier: Diversion has a longer barrier that consists of smaller river rocks and looks to have a few metal stakes in place. In larger flows, they would have to come in and re-work/fix the barrier. There are also new tarps on the diversion barrier.

Head Gate & Ditch: A tree is in the gate opening, proving it hard to close gate if necessary.

River: It does provide a gentle gradient of flowing water, to get around the barrier. Up-stream looks to be 2 well-constructed man-made pools; there are segments of the walls that are loose. There does not seem to be much cut-bank issues.

Access: There are two access points; if the barrier were to be worked on both would have to be accessed by foot. One of the points is over the Blue Jays Bridge and the other is through a property owner who has the diversion on their land (there is much confusion on who owns this land).

Other: N/A

Decreed Rate Total: 5.07 CFS



**Appendix F:**  
**Watershed Project Final Report**



SECTION 319 NONPOINT SOURCE POLLUTION CONTROL PROGRAM

WATERSHED PROJECT FINAL REPORT

MANCOS RIVER WATERSHED PLANNING PROJECT

By

Chester Anderson  
B.U.G.S. Consulting for the Mancos Valley Watershed  
Group and the  
Mancos Conservation District

5/10/11

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

**Project Title: Mancos River Watershed Plan**, Project Number: OE FAA WQC09000028, Federal Fiscal Year(s): 2006 - FU7, Purchase Order Start Date:12/19/08, Purchase Order Expiration Date:4/11

## INTRODUCTION

The Mancos Conservation District with the Mancos Valley Watershed Group hired Felicity Broennon as the Watershed Coordinator. In 2010 Felicity, the District and the Group turned the coordinator position over the Chester Anderson of B.U.G.S. Consulting.

**The Group consisted of the following members:** Felicity, Broennan, Sante Fe Watershed Group, Kirsten, Brown, Division of Mining Reclamation and Safety, Jack, Burk, Mancos Conservation District, Scott, Clow, Ute Mountain Ute Tribe, Lea, Cody, Mancos Conservation District, Marilyn, Colyer, Mesa Verde National Park, Pam, Coppinger, , David, Frederick, , Steve, Hawkins, Mancos Conservation District+, Nadia, Hebard, Mancos Conservation District, Barb, Horn, Colorado Division of Wildlife, Raymond, Keith, Mancos Conservation District, Gary, Kennedy, Mancos Water Conservancy District, Debbie, Kill, Russell, Klatt, Natural Resource Conservation Service/Mancos Conservation District, Jesse, Lanci, , Terry, Moores, Mancos Conservation District, Mike, Rich, Natural Resource Conservation Service, George, San Miguel, Mesa Verde National Park, Eldon, Simmons, Mancos Conservation District, Robin, Strother, Mancos Conservation District, Joni, Vanderbilt, San Juan National Forest, Dick, White, Mancos Conservation District, Tom, Yennerrell, Town of Mancos, Amy, Beattie, Colorado Water Trust, Ronni Egan.

**Contributing Organizations included:** Colorado Water Conservation Board, Colorado Department of Public Health and Environment, Colorado Water Trust, Mancos Conservation District, Mancos Conservation District, Ute Mountain Ute Tribe, San Juan National Forest, Mesa Verde National Park, Montezuma Land Conservancy, Red Arrow Mine, Colorado Division of Wildlife, Mancos Water Conservancy District, Natural Resources Conservation Service, Town of Mancos, Mancos Chamber of Commerce, Colorado State Parks, Mancos Rural Water, San Juan Citizens Alliance, Wilbur Engineering, Bureau of Land Management, Bureau of Reclamation, Division of Reclamation, Mining, & Safety, San Juan National Forest Service, San Juan Resource Conservation and Development, Southwest Water Conservancy District,

Seven stakeholder meetings were held to discuss the process, develop goals and objectives and next steps. All meetings were open to the general public.

The purpose of the watershed management plan was to identify and develop a plan to address watershed objectives including high concentrations of zinc and copper, impacts of historical levees, degraded diversion structures and low summer flows. In addition, a water quality and benthic macroinvertebrate monitoring component of the plan was developed to ensure the management measures recommended were working. The Watershed Plan was completed and provides guidance for moving forward to address the non-point source pollution in the watershed.

The primary water body addressed was the Mancos River, HUC # 14080107. The Mancos River is a tributary of the San Juan River in the southwest corner of Colorado. It begins on Forest Service land, flows through private property, Mesa Verde National Park, the Ute Mountain Ute Reservation, into the state of Utah and the Navajo Nation before joining the San Juan River. Its primary use is for agriculture and also has benefits to native fisheries and wildlife habitat. The Mancos Conservation District (MCD) spearheaded the watershed planning process. One fork of the Mancos River, the East Fork, is a 303(d) listed river for copper and part of the Mancos River main stem was listed for zinc.

The Mancos River watershed is divided into 3 main segments with sub-segments according to the Colorado Water Quality Control Commission Classification and Numeric Standards for the San Juan and Dolores River Basins, Regulation No. 34. The upper portion of the watershed or Segment 4a, and Mancos Reservoir (Jackson Gulch Reservoir) or Segment 4b, are classified as Aquatic Life Cold 1, Water Supply, Recreation, and Agriculture. The middle portion of the Mancos main stem near highway 160 and the town of Mancos to the Ute Mountain Indian Reservation is segment 5a and the lower portion from below the reservation to the Colorado/New Mexico border is segment 5b. Both of these segments are classified as aquatic life warm 2 and not for water supply. Similar classifications are assigned to the tributaries of the middle and lower reaches of the river and correspond to segments 6a-c.

The East Mancos River portion of Segment 4a or COSJLP04a is impaired for copper. On the 2008 303(d) list, all of segment 4a was listed for zinc. Upon further review of the supporting data for the listing of segment 4a by the Water Quality Control Division (WQCD) staff it was shown that it is segment 5a, COSJLP05a, or the main stem below Highway 160 that is impaired for zinc. This correction will be made in the 2010 revision of the 303(d) list. In these impaired segments the aquatic life uses are the most impacted by heavy metal pollution. The East Fork is a high priority for TMDL development whereas the main stem is a lower priority. Preliminary work has been done on a TMDL for the East Fork.

Several studies have been done on the East Fork. The Colorado Department of Public Health and Environment, Hazardous Materials and Waste Management Division completed a site inspection on the East Fork in 2005 for metals pollution under a cooperative agreement with EPA. A recent survey (2006) of macro invertebrates taken just below the confluence of the East Fork and Middle Fork of the Mancos revealed that acidic contamination is moving downstream and that aquatic life cannot be supported. Testimonials from locals further reveal that this particular stream used to be a viable fishery as late as the 1970s.

Both Mesa Verde National Park and the Ute Mountain Ute Tribe are located downstream of the Mancos Valley. Both entities are struggling to produce viable habitat for several types of fish including the round-tailed chub a State listed species of special concern. Part of the difficulty of providing habitat is low flows during the summer months.

With rapidly increasing development, continuing agricultural use, expanding recreational opportunities, and an increasing concern by the general populace regarding water quality and quantity, the MCD was eager to continue its work in the watershed planning process.

## PROJECT DESCRIPTION

The MCD's vision of creating a watershed restoration and protection plan was a landmark effort to address the water quality and quantity issues from a holistic approach using Colorado's Watershed Cookbook: Recipe for a Watershed Plan. Watershed assessment and planning was an iterative process involving the coordinated efforts of various partnerships.

**Environmental Goal:** Improve water quality in the watershed by attaining applicable water quality standards that support designated uses.

**Programmatic Goal:** Create a watershed plan, create and implement educational outreach programs, and use the plan to guide implementation of prioritized needs.

**Objective 1.** Develop a comprehensive watershed management and protection plan through a collaborative partnership effort. **Completed with an extension and within budget**

**Objective 2.** Develop an education & outreach program designed to increase awareness of resource concerns within the watershed. **Completed on time and within budget**

**Objective 3.** Characterize metals pollution in East Fork of the Mancos, a 303-(d) listed River. **Completed on time and within budget**

**Objective 4.** Complete administrative requirements of the nonpoint source funding. **Completed with an extension and within budget.**

The Mancos Conservation District (MCD) was the organization responsible for identifying the need and initiating the process for a long-term watershed management plan. Established in 1948 to represent private and public landowners of the Mancos Valley, the Conservation District mission is to provide leadership for the conservation of natural resources to ensure health, safety, and general welfare of the citizens through a responsible conservation ethic. The district concluded a three-year, multi-million dollar salinity control/water conservation project.

No BMPs were employed as part of this project.

This project had strong support throughout the watershed as evidenced by the high attendance (over 40 people) at the two initial public meetings held at the beginning of the project to inform about the project. Also, 15 local citizen volunteers were trained in a two-day workshop led by

University of New Mexico Professor Dr. Pete Stacey, to monitor specific stretches of the Mancos River for functioning condition of the riparian corridor.

An NRCS funded Rapid Watershed Assessment; a process which laid the foundation for partnerships with landowners and agency representatives alike, was completed at the beginning of the project. Also set up were five water quality monitoring stations under the Colorado River Watch program. Three volunteers were helping with that monitoring, in addition to the Mancos Middle School science classes. In addition, a biomonitoring program was developed using benthic macroinvertebrates. We also worked closely with the Ute Mountain Ute Tribe's Environmental Programs Department representatives to collaborate on several restoration projects.

Lead watershed coordinator, Felicity Broennan, either organized or helped with coordinating other projects in the area. For example, she sat on the Board of the Mancos Water Conservancy District. The district was exploring the feasibility of expanding the Jackson Gulch Reservoir. She was also heading up the Mancos Valley Sustainability Initiative, a partnership between the Town of Mancos and the valley residents to become 100% off carbon by 2020. Her involvement with the many projects happening in the valley meant that there was excellent coordination and complementary information at the beginning of the project.

## **ASSESSMENT & MONITORING**

Three water quality monitoring efforts are in place for the Mancos River watershed. The first is the Colorado RiverWatch program that collects monthly samples at 5 stations throughout the Mancos Valley. This program was run in strict accordance with RiverWatch protocols for water sampling.

The second is a water quality assessment developed and performed by the Division of Mining, Reclamation and Safety (DRMS). The goal of this monitoring was to determine the nonpoint source pollutant loadings from mining sites and the pollutant sources, both mining related and background, in the East Fork. This sampling was done in accordance with a sampling and analysis plan. Kirsten Brown of the Durango DRMS office implemented the sampling while EPA labs supplied the necessary lab work.

Lastly the Water Quality Control Division, Environmental Data Unit obtained quarterly water quality samples to support the watershed plan and TMDL development at several sampling sites. These water quality data, complimentary to the RiverWatch and DRMS data, helped provide a clearer picture of water quality issues in the watershed and to draft the TMDL. There was also flow data collected to assist in preparing the TMDLs.

Biological and water quality data collected by the Ute Mountain Utes and Mesa Verde National Park was shared with the group

The sampling and analysis plans for each source of data (biological and chemical) were completed. These SAPPs will help coordinate proposed monitoring efforts and serve as a guide for future work.

## BUDGET

PROJECT TITLE Coal Creek Watershed Water Quality Monitoring Project

PROJECT START DATE August 6, 2004 PROJECT COMPLETION DATE May 15<sup>th</sup>, 2011

FUNDING: TOTAL BUDGET \$73,925.00

TOTAL EPA GRANT \$35,000.00

TOTAL EXPENDITURES  
OF EPA FUNDS \$35,000.00

TOTAL SECTION 319  
MATCH ACCRUED \$38,925.00

BUDGET REVISIONS NONE

TOTAL EXPENDITURES \$73,925.00

## PUBLIC INVOLVEMENT

The public were involved in several ways. First, we had volunteers who were trained to monitor river riparian reaches on an annual basis to track the health and functioning condition of riparian ecosystems. Colorado RiverWatch also involved local school teachers and children. We will also had volunteers help with Mancos River Day, leading school group activities, coordinating the river clean up and taking care of public relations. The interested public were also invited to stakeholder meetings as representatives of the watershed.

## PLANNED AND ACTUAL MILESTONES, PRODUCTS AND COMPLETION DATES

Project Completed	Funding Source
On-Farm pipelines installed throughout the year via EQIP and Basin States Funding.	NRCS EQIP program and Basin States Funding Cost Share Programs
Diversion Point River Stabilization Project	CWCB, SW Basin roundtable, SW Water Conservancy District

Two river restoration projects with a third planned for 2010	CWCB, NRCS, CSNR
Monitor water use at Echo Basin Dude Ranch and follow up on compliance with the water decree the state granted them.	Mancos Conservation District
Water sampling of Mancos River	Via: Colorado RiverWatch
Sudden Aspen Decline volunteer monitoring	National Forest Foundation, Mancos Valley Sustainability Initiative, Mancos Conservation District.
<b>EDUCATION/OUTREACH SERVICES RELATED TO ACTIVITIES</b>	
Irrigation Water Management Seminars were held in the District office. Three Seminars were held during the irrigation months. These seminars were open to all landowners.	Private donations, MCD, Colorado Nonpoint Source Program
Mancos River Day held September 12 and open to the general Public. The event brought in the children from the Mancos School District, landowners from the watershed and anyone who saw the advertising.	Private donations, MCD, Colorado Nonpoint Source Program
Held a watershed tour of on-going projects in the Mancos Valley.	Private donations, MCD, Colorado Nonpoint Source Program
Held a lower watershed tour on May 8 <sup>th</sup> and an upper watershed tour on October 2 <sup>nd</sup> , 2009	Private donations, MCD, Colorado Nonpoint Source Program
Hosted Colorado Water Trust presentation, winter 2009/2010	SW Roundtable
Hosted tour of watershed with Colorado Water Trust, summer 2010	SW Roundtable
<b>MEETINGS, SEMINARS, CONFERENCES HOSTED/ATTENDED RELATED TO ACTIVITIES</b>	
Hosted seven watershed stakeholders meetings to include and inform all stakeholder of the progress being made on the project (2009-2011)	Colorado Nonpoint Source Watershed Planning Grant; Private Donations; National Forest Foundation
Attended the Durango Children's Water Festival	Colorado Nonpoint Source Watershed Planning Grant; National Forest Foundation
Attended San Juan Basin Watershed	State
Attended six Southwest Basin Roundtable meetings	Western Watershed Assessment
Attended Mancos Source Water Protection meetings	Colorado Nonpoint Source Watershed Planning Grant; National Forest Foundation
Hosted Watershed Steering Committee meeting	Colorado Nonpoint Source Watershed Planning Grant

Attended State-wide Teachers Project Wet training	Southwest Water Conservancy District
Attended Climate/Drought seminar	Mancos Conservation District
Attended/Presented at the Sustaining Colorado's Watershed annual conference	Colorado Nonpoint Source Watershed Planning Grant
Hosted 4 Diversion Project meetings June	SW Roundtable
Attended meetings w/Town of Mancos	Mancos Conservation District
Hosted East Mancos Task Force meeting	Colorado Nonpoint Source Watershed Planning Grant; National Forest Foundation
Sample and analysis plan for water chemistry created by DRMS	Division of Reclamation and Mine Safety
Sample and analysis plan for benthic macroinvertebrates created by B.U.G.S. Consulting	Colorado Nonpoint Source Watershed Planning Grant
Sampling, sample processing and reporting of benthic macroinvertebrates completed by B.U.G.S. Consulting	Colorado Nonpoint Source Watershed Planning Grant
Hosted sampling with DRMS and EPA personnel of East Fork, Summer 2009	Division of Reclamation and Mine Safety and EPA staff
Colorado Water Trust completed in-stream flow analysis, spring, 2011	SW Roundtable
Hosted Colorado Water Trust presentation on in-stream flow analysis, spring 2011	SW Roundtable
Draft of website completed	( <a href="http://www.sustainablemancos.com/watershed_project">http://www.sustainablemancos.com/watershed_project</a> )
Brochures with basic information completed	

Contractor and coordinator were in place when the award was made. The milestones were all met with some delay due to a change of coordinators in the middle of the project.

## **EVALUATION OF GOAL ACHIEVEMENT AND RELATIONSHIP TO THE STATE NPS MANAGEMENT PLAN**

The project went beyond what the scope of work that was proposed. All aspects of the State NPS Management Plan were addressed in the Mancos Watershed Plan

## **RELATIONSHIP TO THE STATE NPS MANAGEMENT PLAN**

The Nonpoint Source Management Plan developed for the Mancos River Watershed identified several future projects to address the nonpoint source issues in the East Fork and the impacts to the stream channel in the Mancos Valley. The group has received and solicited further funds to follow up with these projects.



## **SUPPLEMENTAL INFORMATION**

The supplemental information created during the project was a Sampling and Analysis Plan for water chemistry in the East Fork, an analysis of data collected in the East Fork, a SAP and report on benthic macroinvertebrates and an in-stream flow analysis completed by Colorado Water Trust.

## **BEST MANAGEMENT PRACTICES DEVELOPED AND/OR REVISED**

Since this project created a Watershed Management Plan, no best management practices were developed although a BMP project funded by the Colorado State Conservation Board that includes riparian and fish habitat improvements is in the works on a piece of degraded property.

## **MONITORING RESULTS**

Monitoring results for sampling completed by the Division of Reclamation and Mine Safety for water chemistry and by B.U.G.S. Consulting for macroinvertebrates were compiled and reported. This establishes baseline data to determine the effectiveness of future, implemented BMPs. Water chemistry and benthic macroinvertebrate data from Mesa Verde National Park and the Ute Mountain Ute Indian Tribe were also made available to the Group to establish baseline conditions.

## **COORDINATION EFFORTS**

### **COORDINATION FROM OTHER STATE AGENCIES**

The Colorado Division of Reclamation and Mine Safety and the Colorado Division of Wildlife both participated in monitoring and in Steering Committee meetings and staff from the Ute Mountain Ute Water Quality Program participated in Steering Committee meetings. The Mancos Conservation District has been the lead and involved from the beginning of the project.

### **FEDERAL COORDINATION**

Federal coordination occurred with the Bureau of Reclamation, the USEPA, with Mesa Verde National Park, and the San Juan National Forest Service staff. Staff from the EPA participated in Steering Committee meetings and sampling efforts of water chemistry in the East Fork.

### **USDA PROGRAMS (E.G. ENVIRONMENTAL QUALITY INCENTIVES PROGRAM (EQIP), HYDROLOGIC UNIT FUNDING, BUFFER INITIATIVE, CONSERVATION RESERVE PROGRAM**

The NRCS office in Cortez, CO has been involved with EQIP, Rapid Assessments and other services since the beginning of the project and has participated in stakeholder and steering committee meetings. They continue to participate heavily in development and implementation of BMPs in the Mancos Valley.

## **ACCOMPLISHMENTS OF AGENCY COORDINATION MEETINGS**

Agency coordination meetings occurred primarily during steering committee meetings. The major accomplishments were: completion of a Watershed Management Plan and a water quality and benthic macroinvertebrate SAPP and monitoring for the Mancos River watershed and an in-stream flow analysis by Colorado Water Trust. Meetings with agencies resulted in a plan of action to move forward with addressing the NPS pollution and impacts to the watershed in the Mancos Valley.

## **RESOURCES/COORDINATION FROM FEDERAL LAND MANAGEMENT AGENCIES**

Resources from the NRCS to address issues in the Mancos Valley have been garnered for future projects and an action plan with the Forest Service and DRMS has been outlined in the Watershed Management Plan.

## **OTHER SOURCES OF FUNDS**

An application to the CWCB has been submitted to address impacts to the Mancos River originating in the Mancos Valley. Other funds allowed for the redesign of decrepit diversion structures, and in-stream flow analysis, riparian habitat and fish habitat improvements.

## **SUMMARY OF PUBLIC PARTICIPATION**

All meetings were open to the public and land-owners, Mancos town staff and others participated in the meetings.

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

All aspects of the project went well. The only difficult part was the transition from one Coordinator to another.

## **FUTURE ACTIVITY RECOMMENDATIONS**

Next steps are outlined in the watershed plan but specific short-term steps include the following: awarded funds from NRCS to rebuild 3 diversion structures. Funds awarded from Colorado Conservation Board for riparian improvement and fish habitat development on impacted land. Application for funds from the Colorado Water Conservation Board submitted in April 2011. Work with Mesa Verde National Park to redo the Rapid Assessment is in discussion.

There is no Literature Cited, List of Tables, List of Figures or other appendixes with this report. All documents can be found at: <http://www.bugsconsulting.com/Clients/MancosWatershedGroup.aspx>

## **Appendix G.**

### **Diversion Project Draft Final Report**

**Final Report  
Mancos Conservation District  
December 21, 2011**

**CWCB GRANT PURCHASE ORDER INFORMATION**

**Colorado Water Conservation Board (CWCB)  
P.O. # OE PDA 12000000031  
October 26, 2011**

**INTRODUCTION AND BACKGROUND**

This report summarizes the project's history and construction per the approved CWCB Scope of Work submitted for the grant. Photographs of pre- and post- construction are also provided.

In 2007 the Mancos Conservation District mapped and assessed irrigation diversion structures on the Mancos River near the town of Mancos. This assessment identified numerous diversions that were in need of rehabilitation or reconstruction due to required on-going maintenance or inability of the diversion to divert its full water right. These in-channel activities, and in some cases the diversion structure itself, impaired river function and fisheries habitat.

Based on the information gathered from their diversion assessment, in 2009 the Mancos Conservation District sought and received a grant from the Colorado Water Conservation Board (CWCB) for \$18,000 to prepare construction plans for three selected diversions. The Montezuma County Board of Commissioners also contributed \$2000 for the project. In 2010 and 2011, Mancos Conservation District engaged Basin Hydrology, Inc. to prepare detailed construction plans for the Beaver, Willis and Bolen diversions. These three ditch companies applied for and received approval for NRCS EQIP funds to offset some of the rock and concrete costs. The NRCS required that the designs be approved by NRCS engineers. Due to additional costs associated with submitting detailed Design Reports to the NRCS for approval, design reports were only submitted for the Beaver and Willis. A construction plan was produced for the Bolen, but was not submitted as a Design Report to NRCS for approval.

The Mancos Conservation District (MCD) then applied for a Healthy Rivers Fund grant for \$19,900 in April 2011 to cover the cost of obtaining NRCS approval for the Bolen diversion and to offset some of the actual construction costs for all diversions. Due to insufficient funds in 2011, the Healthy Rivers Fund grant request was denied. However, the CWCB suggested that the MCD submit the request for funding to the CWCB's Watershed Restoration Program instead. The Bolen Ditch Company chose not to pursue NRCS approval or funding due to lack of ditch company funds and therefore they could not utilize the awarded monies from the CWCB's Watershed Restoration Program. Consequently, the CWCB allowed the Beaver and Willis to share those funds. Of the \$ 19,900 amount, \$14,400 was allocated to construction and approximately \$5,000 was budgeted for project administration.

## PROJECT OBJECTIVES AND DELIVERABLES

As stated in the October 2011 Scope of Work, the four project objectives were:

- Construct in-channel diversion structures.
- Provide construction staking and oversight.
- Prepare as-built plans of completed structures (basically the same as design plans).
- Provide fiscal and grant **Project Administration**.

The project was fully completed on xxxxxx, successfully achieving each of the stated objectives. The projected long term benefits to the Mancos River of the completion of this project are passage of high flows, increased channel bed and bank stability in the vicinity of each diversion, reduced bank erosion, increased fish movement past these diversions, and increased use of deep water habitat (pools) by trout and native fish. The projected long term benefits to irrigators from the completion of this project are the ability to clean diversion channels through use of newly installed sluice gates, and the ability to divert the full water right associated with each ditch, when available, with reduced maintenance costs.

## PRE-PROJECT DIVERSIONS

Prior to this project, the Beaver diversion's method of diverting water from the river channel consisted of an in-channel gravel berm that required reconstruction after high flow events. During low flow periods, the Beaver could generally divert its full water right by constructing a gravel berm across the channel which basically diverted the entire river to its heading. As a result of this berm having to be reconstructed each year, channel bed and bank disturbances occurred. The berm created a fish barrier and dewatered approximately 170 feet of channel between the ditch inlet and where the heading's overflow system (a pipe and channel) returned water back to the channel.

The Willis could not divert its full water right during low flow periods due to the lack of a formal in-channel diversion structure. The Willis diversion's method of diverting water to an old and non-adjustable heading consisted of hand placed rocks in the river with one bank of the diversion inlet channel comprised of a collection of hand-placed rocks, tree limbs and fabric.

## POST-PROJECT DIVERSIONS

At both the Beaver and the Willis diversions, cross vane rock structures were placed in the river channel to establish water elevations during low-flow periods so that water would be diverted to diversion headings. These rock structures are intended to provide stable diversion systems that pass high flows, reduce bank erosion, allow fish passage and provide deep water habitat (pools).

Mark Oliver (Basin Hydrology, Durango) provided construction staking and construction oversight during construction at both diversions. Dave Derfus (D&D River and Dirt Works, Durango) was the construction contractor for both diversions. T&M Dirt Works (Mancos) delivered the rock and the concrete blocks to both projects. Due to the required water elevation for full water right diversion at the Beaver's existing heading structure, the new in-channel structure's elevation had to be higher than is desirable for sediment transport. The heading structure was only a few years old and could not be modified. The elevation difference between this required water elevation and the down stream channel is ~ 3.5 to 4.0 feet. This amount of drop required the use of three cross vane-type structures to minimize

the amount of drop over each structure. During non low flow periods, the cross vane structures will allow fish movement through the reach and the excavated scour pools will provide deep water habitat during low flow periods and winter.

Large angular sandstone rock (~  $\frac{3}{4}$  CY to 1.4 CY size) obtained from Mesa Sandstone's quarry, just west of Mancos, comprised the in-channel structures. At the entrance to the diversion inlet channel, pre-cast concrete blocks (2'x2'x6') with a tongue and groove system for interlocking purposes were used. They were obtained from Four Corners Materials in Farmington, NM. Their purpose is to define the width and elevation at the diversion ditch inlet and to provide a solid structure for the ditch company to install a frame system to secure check boards during high river flows. The check boards will limit the amount of water entering the diversion inlet ditch during high flows and to provide a low elevation scour area to reduce the amount of sedimentation at the ditch inlet. Approximately 148 CY yards of rock and 35 concrete blocks were used for the new in-channel diversion system at the Beaver Ditch heading. Construction was completed in approximately 5½ days. A copy of the construction plan is attached. These plans largely represent the as-built conditions. Pre and post construction photographs are also attached.

The Willis diversion required the installation of an in-channel diversion structure, an embankment to define the right bank of the diversion inlet channel and a new heading structure. A cross vane structure was constructed using large sandstone rock of similar size as was used at the Beaver diversion. The elevation of the spill rocks of the cross vane structure were based on the elevation required to divert the ditch's full water right during low flow periods. A deep scour pool was excavated below the cross vane for high flow energy dissipation and to provide for fish habitat during low flow periods and winter. Excavated channel materials were placed river-left between the river's low flow channel and the diversion inlet channel to construct a flood plain feature between the cross vane structure and the downstream riparian community.

Concrete blocks (the same as those used at the Beaver diversion), were used to construct a restricted opening at the diversion inlet channel, to define the right bank of the diversion inlet channel, a sluice opening and a new heading structure. Rather than mechanical gates, the groove portion of the concrete blocks was notched out using a masonry blade on a demolition saw in order to define the entrance to the diversion inlet channel, the sluice gate adjacent to the heading and the heading gate. The notch is approximately 2½" wide to accommodate a 1½" wide board. Several 2"x 8" boards were cut to the appropriate length so that each opening can be closed off or have a restricted opening. The sluice opening is intended to provide sufficient drop from the diversion inlet opening to the sluice to scour the inlet ditch of accumulated fines. Approximately 32 CY yards of rock and 35 concrete blocks were used. Construction was completed in approximately 4 days. A copy of the construction plans is attached. This plan largely represents the as-built conditions. Pre and post construction photographs are also attached.



**PRE & POST CONSTRUCTION PHOTOGRAPHS**  
**Beaver Diversion**



PRE: Downstream view of ditch inlet (left), diversion berm and river channel (right).



POST: Downstream view of ditch inlet and upstream rock structure (partial, see image below).





POST: Downstream view of upstream rock structure and channel.



POST: Upstream view of ditch inlet and upstream rock structure.





PRE: Upstream view of diversion berm and river channel.



POST: Upstream view of cross vane structures.



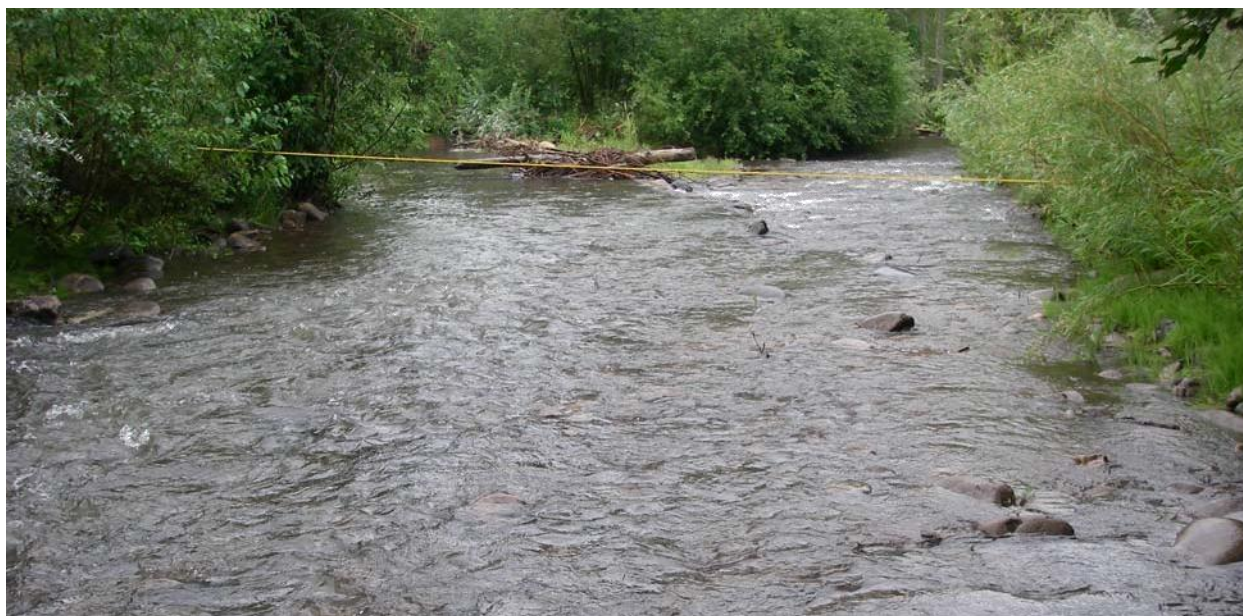


POST: Hillside view of diversion inlet and cross vane structures (river flow is right to left).

DRAFT



### Willis Diversion



PRE: Downstream view of ditch inlet (left) and river channel (right).



POST: Downstream view of ditch inlet (left) and river channel (right).





PRE: Downstream view of ditch inlet (left) and hand-placed diversion rocks (right).



POST: Downstream view of ditch inlet (left) and river channel (right).





PRE: Upstream view of diversion inlet channel and river.



POST: Upstream view of diversion inlet, diversion channel and cross vane structure.





PRE: Downstream view of non-functional heading structure.



POST: Downstream view of new heading (left) and sluice opening (right).

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