

**Deliverable for Comanche and Cordova Creeks Watershed Restoration Action  
Strategy, Education, and Restoration Project (FY01-Q)**

**WATERSHED RESTORATION ACTION STRATEGY  
(WRAS)**

**for the**

**CORDOVA CREEK WATERSHED**

**Prepared by**

**Bionomics Southwest**

**For**

**Quivira Coalition**

**July 2001**

## **INTRODUCTION**

The Federal Clean Water Action Plan (CWAP) of 1998 was developed to help meet the goals of the Clean Water Act through state-led cooperative efforts. These efforts attempt to identify and prioritize watersheds with water quality concerns. A New Mexico Unified Watershed Assessment (1998) was conducted by a statewide task force in response to the actions mandated in the CWAP. New Mexico's Unified Watershed Assessment identified 21 out of New Mexico's 83 watersheds as "in need of restoration" (Category 1). Cordova Creek is designated as a Category 1 watershed.

This Watershed Restoration Action Strategy (WRAS) for the Cordova Creek subwatershed focuses on restoring and protecting water quality which is currently impaired in this Category 1 watershed. The WRAS is a required product of the CWAP process, and has been developed for a variety of planning, reporting, and funding purposes. The structure and content of this WRAS draws from previous WRASs developed for other watersheds in New Mexico, in particular the Rio Puerco Watershed Restoration Action Strategy.

This WRAS contains the following:

- A description of the Cordova Creek watershed and waterbodies of concern;
- The public outreach structure and methods that will be used to engage and maintain involvement by both local residents as well as local, state, and federal governments;
- Monitoring and evaluation activities based on water quality and other goals and outcomes needed to refine the problems or assess progress towards meeting these goals;
- The specific water quality problems to be addressed, the sources of pollution, and the relative contribution of sources;
- A strategy for implementing pollution control and natural resource restoration activities;
- A schedule for implementation of these restoration activities; and
- Funding needs to support the implementation and maintenance of restoration measures.

## **WATERSHED SETTING**

Cordova Creek is located within the Sangre de Cristo Land Grant in the Sangre de Cristo Mountains which is situated in the north central part of New Mexico. The upper reaches of the Creek where erosion is most severe is located on private property owned by Ski Rio. The property consists of 3000 acres of which 910 acres are developed. The top portion of Cordova Creek watershed lies within Ski Rio property. Seven miles of creeks make up the headwaters within the Ski Rio portion of the watershed. Cordova Creek drains approximately six square miles of watershed above the Ski Rio Day Lodge. Cordova Creek is a tributary to Rio Costilla within the upper Rio Grande watershed.

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Slopes have been contoured and cleared for ski runs, and in some places, Cordova Creek has been modified from its original position within the valley to make room for ski area improvements. Vegetation has been inadequately reestablished to prevent rills and gullies from forming on ski slopes. Up to a million gallons of water from snowmaking can be applied to the slopes in the form of snow in one application. The normal channel capacity of Cordova Creek is not adequate to carry the additional runoff from snowmaking, resulting in accelerated stream bank and bed erosion. Riparian vegetation has been removed or has been lost through severe erosion of Cordova Creek banks. The remaining riparian vegetation is in jeopardy because of down cutting of the stream and loss of floodplain function. Logs and wood debris left over from slope clearing remain within Cordova Creek channel and in some places is exacerbating the erosion problem. Because of increased slope runoff, culverts have become undersized and are creating severe headcuts and gullies.

Cordova Creek has been monitored as part of the Total Maximum Daily Load process for exceedances of New Mexico water quality standards and has been listed on the 303d list for turbidity, stream bottom deposits, and total phosphorus. Non-point source contributions are associated with these exceedances. Pollutant source summary lists removal of riparian vegetation, streambank modification/destabilization, resort development, land development and recreation as some of the contributing sources. The BMPs proposed for this project will address these non-point sources to significantly reduce pollutant loadings in the headwaters of Cordova Creek. These BMPs include revegetating slopes, constructing water bars on slopes to areas where water will be most beneficial, and changing the characteristics of the creek to improve its stability and provide a cold water fishery habitat. The Creek will also be assessed for level of departure and restored to a functioning high quality cold-water fishery.

Water quality degradation within the watershed is the result of a number of factors. In addition to the erosion on Ski Rio slopes, substantial erosion results from unstable banks along NM 196. NM 196 was originally constructed in the Cordova Creek channel. In order to build the road, extensive cuts and fills were constructed. These cuts and fills remain unvegetated and therefore highly susceptible to erosion during rain events. The New Mexico State Highway and Transportation Department has initiated a study to evaluate possible new locations for the road.

## **SECTION 1: PUBLIC OUTREACH**

Public and stakeholder involvement is one of the primary activities of this project. The goal of the public involvement process is to ensure a multifaceted, proactive and responsive interaction with the public, land owners, resource agencies and local officials. During the first year, we will conduct an extensive public/stakeholder outreach program. This outreach and technical assistance program will primarily involve three groups: 1.

The 182 member Rio Costilla Cooperative Livestock Association (RCCLA) who use the watershed for grazing cattle and recreation; 2. Ski Rio, a major recreational facility at the headwaters of Cordova Creek; and 3. Private land owners.

As part of this project's activities an education and information program will be developed at Ski Rio. This will include an informative web page on the Ski Rio Website for schools, the local community, visitors to Ski Rio, and to other ski resorts. Other plans are to prepare a display, field trips, visitors' and children's activities, newspaper articles, website information and other informational materials for outreach. Ski Rio will also have a representative participate in meetings with New Mexico State Highway and Transportation Department and other stakeholders to coordinate Cordova Creek restoration activities. With the cooperation of NMED, Ski Rio will also initiate a community organization of ski resort property owners to increase awareness of water quality issues and of using BMP's on their land and access roads, and to participate in a Watershed Restoration Action Strategy for Cordova Creek.

Cooperating stakeholders include NMED/SWQB, New Mexico State Highway and Transportation Dept., Rio Costilla Cooperative Livestock Association, New Mexico Department of Game and Fish, Ski Rio Property Owners, cattle owners using the property for grazing, and the Taos Soil and Water Conservation District.

At least two public workshops—a riparian restoration workshop and a grazing management workshop—will be held each year in the project area. The Quivira Coalition will organize and coordinate a series of educational activities and will produce two newsletters on related subjects. In addition, a brochure on watershed restoration and management is being produced specifically related to issues found in the Rio Costilla Watershed. This brochure will be distributed to local residents including the 182 members of the Rio Costilla Cooperative Livestock Association.

We expect the collaborative identification of watershed management goals and management opportunities will ultimately lead to the development of a WRAS for the larger Rio Costilla Watershed and participation in a larger watershed coalition.

Ongoing coordination is expected with the New Mexico State Highway and Transportation Department, Army Corps of Engineers, and U.S. Fish and Wildlife Service to evaluate the feasibility and issues associated with relocating NM 196 and restoring the original creek channel and floodplain. From this starting point, we will initiate a broader discussion of land use and opportunities for improving land use practices.

#### WRAS Development

Development of this WRAS included input from the following agencies and organizations:

- Ski Rio

- Quivira Coalition
- Bionomics Southwest
- Taos Soil and Water Conservation District
- Rio Costilla Cooperative Livestock Association
- New Mexico State Highway and Transportation Department
- New Mexico Environment Department

## **SECTION 2: MONITORING AND EVALUATION**

Monitoring and evaluation of projects undertaken by this WRAS is an important element in adjusting and improving on management strategies based on the performance of installed BMPs. The goal of the assessment and monitoring plan is to develop a long-range monitoring program that achieves two objectives:

- Targeting the implementation of BMPs in areas that have the greatest potential for contributing sediment into Cordova Creek; and
- Tracking trends in reducing sediment loads and improving the overall health of the watershed.

Relatively little baseline data has been collected to date on the conditions that contribute to the water quality problems reported in the TMDL Report. Water quality data are currently being collected through the TMDL process. Biological, geomorphological and fisheries data are also being collected for Cordova Creek and reference reaches, (Midnight Creek and others) by the New Mexico Environment Department.

An initial assessment of upland conditions has been conducted by The Quivira Coalition with support from Ski Rio and the Taos Soil and Water Conservation District. The assessment consisted of walking each of the slopes and determining the stability and potential treatments needed to improve the current situation with regards to erosion contribution to the watershed. This preliminary assessment determined that the majority of slopes are either at risk with signs of erosion and soil loss, including rills and deposition sites or have already experienced substantial soil erosion.

An upland monitoring protocol will be developed based on the USDA's Jornada Experimental Rangeland Monitoring Protocol. The objectives of the monitoring protocol include:

- Determining the stability of the watershed associated with Cordova Creek both at Ski Rio and its lower reaches.
- Assessing contributing factors to accelerated erosion with emphasis on ski slopes and grazing impacts.
- Determining if proposed treatments are effective in slowing erosion to acceptable levels.

Digital Ortho Quarter Quad (DOQQ) maps were used in conducting the initial assessment and will serve as base maps for collecting more detailed monitoring data. Monitoring

units have been identified and a monitoring design defined to fit priorities of project. A three tiered ski slope stability rating system will be used as a guide to determine which areas are in greatest need of monitoring; since potential natural vegetation and soils are not valid indicators in this case. Two photo points have been established along with more detailed but still qualitative Rangeland Health Assessments conducted at those locations. An additional eight to ten monitoring sites will be selected prior to initiation of treatments at those sites. These sites will be chosen based on their ability to represent similar sites receiving treatments. The following detailed site data will be collected at each of the monitoring points.

1. Photo points
2. Line point intercept for vegetative cover and composition
3. Gap intercept or substitution of measurement to nearest perennial plant.
4. Soil penetrometer measurements (if vehicle is used to get to sites!)

The frequency of measurements has not yet determined. Recommended frequency is yearly for photo points and 1-5 years for other indicators. The number of years is influenced by level of treatments applied (i.e., grazing management, slope plantings, etc.). The more rapid the rate of treatments applied the more frequent the monitoring will be.

While the effectiveness of slope treatments will be evaluated using upland health assessment and monitoring techniques, water quality will be monitored following the guidelines described in the Quality Assurance Project Plan for Water Quality Management Programs 2000 (NMED 2000). Specific water quality factors to be measured include turbidity, temperature, and stream flow.

An important element to restoring Cordova Creek is to quantify the hydrologic changes in the watershed caused by snowmaking, and the additional runoff that the Creek must accommodate. This will be accomplished by a hydrologic study and stage gage recording in combination with morphological characterization of Cordova Creek and reference reaches.

Additional baseline data will be compiled about the Cordova Creek watershed. This data will include both social (e.g., land uses and ownership, economic activities that depend on or impact water quality, history of the area, key stakeholders, and critical issues, concerns and constraints) and ecological (e.g., stream condition, existing vegetation, land condition).

Monitoring will be conducted by the staff of Ski Rio, the New Mexico Environment Department and Cibola Services. A monitoring schedule will be developed based on the type of data being collected and the implementation of individual projects. Monitoring data will be compiled in a GIS system.

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**SECTION 3: DEFINING SPECIFIC WATER QUALITY PROBLEMS**

Cordova Creek currently exceeds New Mexico water quality standards for turbidity, stream bottom deposits (SBD), and total phosphorous. These exceedances are documented in the *Total Maximum Daily Load for Turbidity, Stream Bottom Deposits, and Total Phosphorous on Cordova Creek*, NMED, November 1999. Cordova Creek is a major contributor of sediment to the Rio Costilla.

Ski Rio is a four-season recreational facility and alpine ski area that was established in 1982. Capital improvements include a day lodge, 3 hotels, 3 ski lifts, about 900 acres of ski-able terrain, and snowmaking capabilities. A developing subdivision is located next to the Ski Resort.

Slopes have been contoured and cleared for ski runs, and in some places, Cordova Creek has been modified from its original position within the valley to make room for ski area improvements. Vegetation has been inadequately reestablished to prevent rills and gullies from forming on ski slopes. Continuous, unrestricted summer grazing of approximately 100 head of cattle prevents the development of deep rooted native vegetation in high productivity areas.

A snowmaking pond with 1,000,000-gallon capacity is located in the Creek next to the day lodge. Sediment accumulations are removed from the snowmaking pond and placed back along the banks of Cordova Creek. The snow-making pond also acts as a barrier to fish passage. Up to a million gallons of water from the snowmaking pond can be reapplied to the slopes in the form of snow in one application. The normal channel capacity of Cordova Creek is not adequate to carry the additional runoff from snowmaking, resulting in accelerated stream bank and bed erosion.

Riparian vegetation has been removed or has been lost through severe erosion of Cordova Creek banks. The remaining riparian vegetation is in jeopardy because of down cutting of the stream and loss of floodplain function. Logs and wood debris left over from slope clearing remains within Cordova Creek channel and in some places is exacerbating the erosion problem. Because of increased slope runoff, culverts have become undersized and are creating severe headcuts and gullies. Lack of erosion control measures is characteristic of dirt roads and construction sites at the subdivision.

In addition to the ski area development, NM 196 is currently situated in the original Cordova Creek channel. In order to build the road, extensive cuts and fills were constructed. These cuts and fills remain unvegetated and therefore highly susceptible to erosion during rain events. The New Mexico State Highway and Transportation Department has initiated a study to evaluate possible new locations for the road. Relocating NM 196 out of the creek channel and restoration of the creek channel will be a significant element in improving water quality in Cordova Creek.

## **SECTION 4: ACTIONS TO BE TAKEN AND DESIRED WATER QUALITY GOALS AND OUTCOMES**

### **Current Goals and Actions**

Three goals apply to efforts to improve water quality in Cordova Creek. Watershed restoration projects focus on:

- reducing erosion from slopes through revegetation;
- allowing existing vegetation to develop and reproduce to the fullest extent possible; and
- Changing the geomorphological characteristics of the Creek to promote stability over time.

Projects implemented under this WRAS will address:

- Sediment reduction through sediment retention;
- Vegetation and habitat improvement both in uplands and in riparian/wetland areas; and
- Support and promotion of other watershed factors through public awareness, promoting economic development, and improved resource management.

These goals will be achieved through a variety of specific activities which are listed below:

- Improved water distribution through the creation and maintenance of water bars on roads and slopes;
- Slope revegetation using conventional seed and mulch techniques as well as modified “poop and stomp” approaches;
- Improved grazing management of cattle currently grazing on the Ski Rio property;
- Creation of temporary, growing season only, exclosures,
- Riparian restoration;
- Repair and relocation of culverts.
- Public workshops on grazing management;

Activities undertaken to date include:

- Initiation of an initial alignment study by the New Mexico State Highway and Transportation Department to evaluate alternative locations for NM 196;
- Slope preparation to remove existing gullies which have formed over the past two years;
- Meetings with members of the Rio Costilla Cooperative Livestock Association (RCCLA) to discuss grazing management options;
- An initial slope stability assessment Rangeland Health assessment techniques and development of a preliminary grazing management plan;
- A grant from the Taos Soil and Water Conservation District was obtained to fund the initial slope assessment work and to begin seeding and mulching slopes.



- Applications have been submitted for 319 (h) funding from the Environmental Protection Agency and from the New Mexico Soil and Water Conservation Commission: Water Quality and Conservation Program.

## Future Actions

Implementation of the restoration plan will focus on the following categories of actions that are necessary to restore water quality and healthy watershed function in the Cordova Creek subwatershed:

### **Public Outreach**

- Provide workshops on grazing management, erosion control, road management and riparian restoration to local land owners and Ski Rio managers.
- Provide technical support and training for baseline data collection and monitoring.
- Provide coordination support to assist in the planning and implementation of BMPs
- Plan and implement a display, field trips, visitors' and children's activities, newspaper articles, website information and other informational materials for outreach.
- Develop a brochure to inform the 182 members of the RCCLA about watershed issues and planning.
- Initiate a community organization of ski resort property owners to increase awareness of water quality issues and of using BMP's on their land and access roads

### **Implementation of Best Management Practices**

- Perform earthwork, including waterbar maintenance, recontouring slopes away from Cordova Creek, and removing piles of loose sediment washing into Cordova Creek.
- Implement slope treatments on high priority slopes. This will include seed, mulch and fertilize slopes and disturbed areas contributing sediment to Cordova Creek.
- Implement stream restoration (Phase I): including restoring riffle/pool – step/pool channel characteristics and meanders; stabilizing banks with wood, rocks and riparian vegetation; reducing, redirecting and spreading flow into Cordova Creek and its tributaries from ski slopes; and delineating buffer zones to remain natural and undisturbed to protect Cordova Creek from impairments.
- Construct exclosures around Cordova Creek and other heavily grazed areas to improve the vegetative condition
- Work with graziers to implement a grazing management plan that minimizes impacts to riparian, wetland and wet
- Realign NM 196 to reduce bank erosion.

- Implement stream restoration (Phase II): including restoring riffle/pool – step/pool channel characteristics and meanders; stabilizing banks with wood, rocks and riparian vegetation.

### Data Gathering and Monitoring

- Measure flow and monitor water quality in various segments of Cordova Creek
- Monitor in support of TMDLs
- Conduct upland monitoring of selected sites
- Prioritize slope treatments based on erosion risk
- Collect data on existing social and ecological conditions

### SECTION 5: IMPLEMENTATION SCHEDULE

Lead	Project	Duration	Status
TSWCD	Assess slope stability of all slopes	Summer 2001	completed
Ski Rio	Perform earthwork on eroded slopes	2001 - 2002	
Ski Rio	Construct cattle exclosure	Spring 2002	ongoing
Ski Rio	Slope treatments	2001-2003	ongoing
Quivira	Conduct riparian assessment		
Ski Rio	Implement stream channel restoration Phase 1	2002	
NMSHTD	Evaluation and realignment of NM 196	2001-2005	ongoing
Ski Rio/RCCLA	Implement grazing management plan	2001-	ongoing
Ski Rio/Quivira	Public Outreach	2001-	ongoing
NMED	Implement stream channel restoration Phase 2	2006	Proposed

### SECTION 6: FUNDING NEEDS

The funding table that follows shows both committed funds for projects planned and scheduled for implementation and uncommitted funds for future projects.

Task	Funding				Status
	Federal	State	Other	Total	
Develop WRAS	\$12,000	\$30,000	\$4,500	\$46,500	ongoing
Assess slope stability of all slopes			\$3,500	\$3,500	complete d
Perform earthwork on eroded slopes			\$36,000	\$36,000	ongoing
Construct cattle exclosure	\$5,000		\$2,500	\$7,500	
Slope treatments	\$25,000	\$60,000	\$12,000	\$97,000	
Baseline Data Collection and Monitoring	\$5,000			\$5,000	
Plan and implement stream channel restoration (Phase 1)	\$52,000		\$16,000	\$68,000	
Evaluation and realignment of NM 196	\$1,500,000	\$300,000		\$1,800,000	ongoing
Implement grazing management plan			\$2,500	\$2,500	
Public Outreach	\$15,000		\$5,000	\$20,000	
Plan and implement stream channel restoration (Phase 2)	\$1,000,000	\$300,000	\$200,00	\$1,500,000	