1. Project Titles: Multi-Basin Riverine Restoration in New Mexico: Comanche and Gold Creek

2. Project Applicant: The Quivira Coalition, 1413 2nd St., Suite #1, Santa Fe, NM 87505; phone: 505-820-2544, fax 505-955-8922; mbain@quiviracoalition.org. The Quivira Coalition is a Santa Fe non-profit organization whose mission is to foster ecological, economic and social health on western landscapes through education, innovation, collaboration, restoration and progressive public and private land stewardship. The Quivira Coalition has and is currently implementing EPA 319(h) Water Quality and EPA Wetland projects in watersheds throughout New Mexico.

3. Project Areas: In the **Upper Rio Grande Basin**, treatments will be implemented on Comanche Creek and its tributary, Gold Creek, located within the Valle Vidal Unit of Carson National Forest of north central New Mexico, Taos County (Appendix A, Map A). Comanche Creek is a tributary to Rio Costilla within the Upper Rio Grande watershed (USGS Hydrologic Unit Code 13020101015) and contributes 27,430 acres or 43 square miles to the Costilla Watershed (Pittenger 2002). The headwaters of Comanche Creek lie at an elevation of roughly 10,400 feet. It flows north for 11.80 miles to empty into the Rio Costilla at an elevation of 8,940 feet. Project locations:

- Comanche Creek (UTM: 475186.978171/4070768.2807) with 294 feet of channel and 0.41 acres affected by treatment on Carson National Forest (Map B).
- Gold Creek (UTM: 474359.503656/4070192.022522) with 519 feet of channel length and 3.8 acres potentially affected by treatment on Carson National Forest (Map C).

4. Start and End Dates: Proposed start date would be September 1, 2007 (after completion of signed contract) and ending June 30, 2011.

5. Problem Statement: Throughout the American Southwest and across arid landscapes of the world, rivers are undergoing an epoch of channel incision or downcutting characterized by the loss of floodplain access; reduced sinuosity; accelerated rates of stream bed and bank erosion; reduced bank storage; radical fluctuations between flooding and no flow events; loss of wetlands and wetland habitats; and declines in wildlife and fish species diversity and abundance. Comanche Creek, Gold Creek and the Mora River have experienced degradation due to human impacts from agricultural manipulations, resource management practices and road drainage.

The current condition of **Comanche Creek** and its tributaries is clearly a product of past human land uses within the watershed. Comanche Creek Watershed has been subject to extensive clear-cutting, road construction, overgrazing and mining. Since 1982, when acquired by the US Forest Service, hydrological condition and channel stability have been on an upward trend. Water quality at Comanche Creek has been monitored by the New Mexico Environment Department (NMED) as part of the Total Maximum Daily Load (TMDL) process. The TMDL process has identified exceedences of stream bottom deposits, aluminum, and temperature standards. Substrate analyses conducted on Comanche Creek by NMED in the 1990s recorded a high frequency of small particle size classes (NMED 1996).

Investigation into the origin of these fine sediments demonstrated that they were coming from: hillslopes with unconsolidated soils showing rivulets that contact the stream channel; destabilization of stream banks in lower, middle and upper reaches; livestock grazed annually throughout the Comanche Creek basin; road-cuts and road-banks that have unconsolidated soils; culverts and bridges that alter flow and increase erosion; roads lacking proper drainage features; and headcutting in Comanche Creek and its tributaries (NMED 1996:29-30). Streambank stability, geomorphology, and cover problems relate to wildlife use (elk), livestock grazing, and human land use and development.

Comanche Creek has been selected by New Mexico Department of Game & Fish (NMDG&F), the USDA Forest Service and NMED for accelerated recovery of the Rio Grande Cutthroat trout (RGCT) to mitigate the listing as an Endangered and Threatened candidate species.

Like most members of the trout family, Rio Grande Cutthroat trout require clear, cold water, naturally-fluctuating flows, low levels of fine sediment in channel bottoms, well-distributed pools, stable

streambanks, and abundant stream cover (http://www.westerntrout.org/trout/profiles/rgct.html). Long reaches of Comanche Creek lack abundant stream cover and have eroding streambanks of the 1st and 2nd terraces. These eroding banks deposit excess sediment into the creek increasing turbidity.

> *Turbidity is a measure of water clarity, how much the material suspended in water decreases the passage of light through the water. Suspended materials include soil particles (clay, silt, and sand), algae, plankton, microbes and other substances. These materials are typically in the size range of 0.004 mm (clay) to 1.0 mm (sand). Turbidity can affect the color of the water.* ***Higher turbidity increases water temperatures because suspended particles absorb more heat.*** *This, in turn, reduces the concentration of dissolved oxygen (DO) because warm water holds less DO than cold. Higher turbidity also reduces the amount of light penetrating the water, which reduces photosynthesis and the production of DO.* ***Suspended materials can clog fish gills, reducing resistance to disease in fish, lowering growth rates, and affecting egg and larval development. As the particles settle, they can blanket the stream bottom, especially in slower waters, and smother fish eggs and benthic macroinvertebrate.*** *Citation:* ***Volunteer Stream Monitoring: A Methods Manual*** *at http://www.epa.gov/owow/monitoring/volunteer/stream/.*

The restoration of Comanche Creek and its tributaries has been emphasized in order to support the RGCT recovery effort and in 2006, Comanche Creek was designated as an Outstanding Natural Resource Waters (ONRW) by the New Mexico Water Quality Control Commission.

Gold Creek is a tributary of Comanche Creek (Map D, page 21)**.** Gold Creek has downcut over time and lost floodplain access. A road that crosses the creek is supported by a culvert that was installed below grade, creating up-stream headcuts. The road embankment blocks stream access to its floodplain downstream, is causing a scour pool that is lowering the bed of the channel, and is impounding water. Catastrophic failure of the embankment could result in the deposition of large volumes of sediment in Gold Creek, eventually reaching Comanche Creek. The culvert is a barrier to passage by fish and aquatic organism passage. The embankment and culvert need to be removed to return the creek to its natural flow pattern and re-connect the channel with its floodplain while preventing excess sediment from entering Comanche Creek and restoring fish passage.

6. Key Persons: The Quivira Coalition staff, ***Tamara Gadzia***, ***Michael Bain, Sheryl Russell, Catherine Baca, Veronica Medwid and Genevieve Head*** and an ***Intern*** will assist in the implementation of this proposed project. The Quivira Coalition Staff will be the fiscal agent for these projects, provide project oversight, organize and implement project tours and workshops, produce semi-annual and final reports, compile monitoring and maintenance reports, assist with geomorphology and vegetation surveys, and implement a permanent photo monitoring plan. Tamara Gadzia will be the Project Financial Administrator and Michael Bain will serve as Project Manager.

Bill Zeedyk, project technical advisor and educator, was awarded a B.S. degree in Forestry from the University of New Hampshire in 1956. He retired from the US Forest Service in 1990 with 35 years experience in forestry, wildlife biology and watershed management. Bill has thirteen years experience as a self-employed private consultant in river, wetland and riparian restoration (Zeedyk Ecological Consulting, LLC). Since 1995, Bill has surveyed, planned, designed and provided technical supervision and monitoring in the installation of more than 70 stream and wetland restoration projects in New Mexico and Arizona. Project locations have included public lands administered by the National Park Service, the US Forest Service, Bureau of Land Management, Rio Puerco Management Committee, Valles Caldera Trust, Los Alamos National Laboratories, Navajo Nation, Santa Clara Pueblo, San Idelfonso Pueblo, Zuni Pueblo, the Cuba, Edgewood, Taos and Tierra Y Montes Soil and Water Conservation Districts and numerous private lands.

Bill has also organized and presented workshops, seminars and short courses in stream channel stabilization and riparian restoration concepts, methods and practices to local, state, regional and national audiences including workshops for the USDA Forest Service, New Mexico Department of Transportation, The Quivira Coalition, Association of New Mexico Soil and Water Conservation Districts, the University of New Mexico and the University of Missouri.

He has received local, state, regional and national awards for wetland and riparian restoration achievements, including awards from the EPA Region 6, USDA Forest Service Watershed Stewardship award, the Ducks Unlimited Taking Wing Award, the New Mexico Riparian Lifetime Achievement Award, and the Tierra Y Montes Soil and Water Conservation District Education and Outreach Award.

Bill has authored several books and field manuals on riparian and wetland restoration and erosion control including:

- *Managing Roads for Wet Meadow Ecosystem Recovery*
- *An Introduction to Erosion Control*
- *An Introduction to Induced Meandering: A Method for Restoring Stability to Incised Stream Channels*
- *An Introduction to Erosion Control*
- *A Good Road Lies Easy on the Land: Water Harvesting from Low-Maintenance Road.*

❑ ***Steve Carson***, Rangeland Hands, Inc., project implementation sub-contractor, is a licensed and insured watershed restoration consulting, design and implementation company. Steve has completed Rosgen Level 1, Applied Fluvial Geomorphology, 2004; Rosgen Level 2, River Morphology and Application, 2005; Rosgen Level 5, Applied Stream Channel Restoration Practices for Restoration Contractors, 2005; Restoration Methods for Riverine, Wetlands, and Cienega Ecosystems, Zeedyk, 2006; and Storm Water Pollution Prevention Plan (SWPPP), Clean Water Consulting, 2007 trainings. His extensive project experience includes:

- Comanche Creek Restoration: 2003 to present: Watershed Assessment and Design team member, field logistical coordinator and implementation team leader for all of the volunteer workshops done by The Quivira Coalition.
- Field Logistical Coordinator and Implementation Team Leader for numerous volunteer workshops sponsored by The Quivira Coalition, 2003 to present on the Dry Cimarron, Loco and Largo Creek, Cedro Creek, Red Canyon Reserve, Galisteo River, etc.
- Instructor, logistics, and equipment operator at numerous Ranch Roads Workshops, training for land managers and agency personnel: CS Ranch, Rowe Mesa Grass Bank, Sandoval County, Colfax County, Public Service Company of New Mexico, Pima County Arizona.
- Rio Puerco Watershed (RPMC): 2006, Prime Contractor and Project Manager for the assessment, mapping and implementation of a 100 square mile, 64,000 acre project area to control the direct sediment contribution from roads systems into the stream channels.
- Cedro Creek: 2006, Prime Contractor, Designer, Project Manager for the installation of 12 boulder filter dams.
- Dry Cimarron: 2006, Prime Contractor and Project Manager for the installation of boulder cross vane systems.
- Navajo Nation EPA, Water Quality: 2006, 2007, Prime Contractor, Designer, Project Management for Ranch Roads and Stream Channel Restoration Projects.
- Taos County Soil and Water Conservation District: 2007, Prime Contractor for the assessment and design of 30 bank erosion project sites throughout Taos County.
- New Mexico Public Service Company: 2004 to present, Prime Contractor, Assessment, Design and Implementation to stabilize roads and stream channel banks on transmission power line right-of-way systems.

❑ ***Craig Sponholtz,*** project implementation sub-contractor, has been an integral part of stream and wetland restoration projects funded by a variety of grant programs. Since starting his company, Dryland Solutions, Inc. in 2003, he has been designing and implementing watershed restoration projects throughout New Mexico. In 2004 he worked with Earth Works Institute on several sites in the Galisteo Watershed. In 2005, Craig began leading volunteer workshops for The Quivira Coalition's Comanche Creek 319 Grant. In 2006 he was a heavy equipment operator on Cedro Creek, another Quivira 319 Grant. He has since led numerous restoration workshops for citizen and student groups at Cedro Creek and taught erosion control techniques at many other locations. Craig has worked with the Wind River

Ranch since 2005. In 2006 he collaborated with Bill Zeedyk to plan and design the restoration of wetlands in three tributary channels of the Mora River. Craig is currently implementing these projects at Wind River Ranch, funded by a Partners for Wildlife Grant. Dryland Solutions, Inc. is equipped and insured to implement watershed restoration projects with hand labor and heavy equipment. Other recent and upcoming projects include: Canoncito wetland restoration implementation; Burro Ciénega tributary channel restoration, design and implementation; Canon Bonito stream restoration, implementation; and Santa Fe River restoration, implementation.

- ***Van Clothier***, geomorphology survey/monitoring sub-contractor, has a B.A. in Physics with a minor in Mathematics from the University of California at San Diego, 1982. He has been a stream restoration student of Bill Zeedyk since 2000 and has completed all of Dave Rosgen's (Wildland Hydrology) Geomorphology and Stream Restoration Courses. He has been involved with riparian and upland restoration and watershed projects throughout New Mexico, providing geomorphology and on-the-ground implementation services. River systems or watershed projects include: the San Francisco River, Anchetta Creek, Nutrioso Creek, Grey Ranch – Malpai Borderlands Group, the Dry Cimarron, Los Alamos Creek, Burro Cienega, Rio Puerco, Ojo Sarco Creek, Rio De Las Vacas, the Galisteo River and the Valles Caldera. Van was also a co-instructor with Bill Zeedyk during the ***Restoration Methods for Riverine, Ciénega and Wetland Ecosystems*** training course in 2006. Van has assisted The Quivira Coalition on all restoration projects as both a contractor and a volunteer and will be responsible for collecting geomorphological data from four drainages as part of this proposed project.
- ***Steve Vrooman,*** vegetation monitoring and geomorphology survey sub-contractor, has an M.S. in Biology from the University of Nevada, Las Vegas, is a graduate of Tom Moody's Natural Channel Design Level II Course and was an instructor and graduate, of Bill Zeedyk's *Restoration Methods for Riparian, Wetland and Ciénega* Ecosystems training course. He is a co-author of the Rio Puerco Management Committee's ***Monitoring Handbook.*** Steve has performed grassland monitoring and/or geomorphological surveys for the Galisteo Watershed Restoration Project, and The Quivira Coalition's Cedro Creek, Comanche Creek and Dry Cimarron Projects. He was also the monitoring contractor for the Rio de Las Vacas Wetlands Restoration Project and wrote a Quality Assurance Project Plan and designed and performed monitoring for the Galisteo Wetlands Planning Project.
- ***Deborah Myrin,*** project GIS coordinator sub-contractor, was a staff member of The Quivira Coalition responsible for on-the-ground mapping and GIS services and for producing all of our riparian restoration project maps. We have retained Deborah as a contractor to continue mapping services for The Quivira Coalition. She will assist with GIS map production as needed.

Landowners and managers include:

- George Long, USFS – Carson National Forest, Questa Ranger District (Comanche and Gold Creek) – public land; 404/401 permitting and archeological clearance; project implementation and onsite oversight.

Contact information for sub-contractors and land managers and owners can be found in ***Appendix E.***

7. Proposal Description:

The goal of these restoration projects is to continue successful restoration treatments along in the Comanche Creek Watershed; to provide for public educational opportunities to learn about riparian restoration practices in New Mexico, and to monitor and maintain these on-going projects over an extended period of time.

These two projects will augment and extend on-going projects and will multiply the benefits from treatments already implemented with public and private funds and public participation. Comanche and Gold creek are part of an on-going EPA 319(h) Water Quality project started in 2001 to restore habitat for The Rio Grande Cutthroat trout. To date, 11,550 feet of channel have been treated with an additional 2,300 feet to be completed in 2007. The proposed treatments will help restore instream ecosystem function and watershed health by increasing channel length and sinuosity, restoring floodplain access,

increasing riparian and wetland vegetation, controlling streambank erosion and sedimentation, and abate channel down-cutting.

Geomorphologic and vegetation monitoring are on-going at Comanche Creek as part of the EPA 319 Water Quality Comanche II grant. The Carson National Forest currently collects temperature data along Comanche Creek. Treatment maintenance, if needed, will be performed on an annual basis by volunteer conservation organizations that now perform such services for projects at Comanche Creek.

These projects will not deplete water. It will instead create the opportunity for perennial flows and maximize the conservation of biological diversity by increasing riparian and wetland vegetation species (which reduce evaporation loss by reducing air flow) and increase the amount of habitat for fish and wildlife. Water stored in the banks will be offset by the reduction of wind induced evaporation.

For Comanche Creek there is an immediate need to stop the input of 110 to 120 cubic yards annually of sediment into waters that support habitat for the RGCT and stabilize the eroding bank that is encroaching on a Forest Service Road as per Task 4-C (Appendix B, photos #1 and #2).

This project will be supported by matching funds from The Quivira Coalition's Land and Water Fund (donations come from private and foundation funds). In-kind matching funds will come from private land owners/managers with volunteer support from local communities, students, the general public, conservation organizations and government agencies.

The Comanche/Gold Creek project will have multiple and diverse partners that include the US Forest Service (Questa Ranger District), riparian restoration consultants, ranchers, Soil and Water Conservation Districts, the Natural Resources Conservation Service, and conservation organizations like the Albuquerque Wildlife Federation, New Mexico Trout, Trout-Unlimited, and NM Wilderness Alliance. All will participate in hands-on educational riparian restoration workshops and tours, and provide local assistance when needed.

Thisprojects will provide educational tours and workshops associated with each drainage, as per Tasks 5-C.

It is expected that each project will require 404/401 permits under the Clean Water Act and archeological clearances. The USDA Forest Service and private land-owners will be responsible for obtaining necessary permits and clearances with help from The Quivira Coalition as needed.

The Quivira Coalition will act as its own Fiscal Agent as it has been as part of three EPA 319(h) Water Quality projects in conjunction with NMED-SWQB.

8. Implementation Plan and Schedule for Comanche and Gold Creeks:

Task 1-C: Refinement and Completion of Individual Project Designs and Implementation Plans. Project designs and an implementation schedules will be created for Tasks 2-6. There is a completed plan for Comanche Creek (Task 4-C). Both restoration treatments will be implemented at the same time.

Dates: September 2007 – March 2008

Outcome: Implementation plan and schedule for all Comanche and Gold Creeks.

Task 2-C: 404/401 Permitting and Archeological Clearances. The Forest Service and private landowners will be responsible for submitting 404/401 permit applications to U.S. Army Corps of Engineers (USACE) with The Quivira Coalition and Bill Zeedyk providing necessary data, maps, graphics and photos as needed. Permitting data for Comanche has been submitted to the Forest Service. Data for Gold Creek will be collected and submitted. Archeological clearances for Comanche Creek are on file at Questa Ranger District and the State Historic Preservation Office (SHPO). An archeological survey for the Gold Creek site has been completed and a report submitted to Questa Ranger District.

Dates: September 2007- June 2008

Outcome: Completed 404/401 application and permit for Comanche and Gold Creeks and archeological clearances on file with SHPO with copies of the reports housed at The Quivira Coalition office and the Questa Ranger District.

Task 3-C: Pre-implementation Geomorphology, Vegetation Monitoring, Photo Documentation and Mapping. A project monitoring plan will be developed for Comanche and Gold Creeks, including a photo monitoring plan with the establishment of permanent photo points at each site. The location of monitoring points will be mapped and baseline data collected before the start of the project.

Comanche Creek Existing and New Channel Baseline Monitoring:

- Rosgen Level 2 survey (Morphological Description Survey) Rosgen, Dave, Silvey, Lee H., ***Field Guide to Stream Classification*****.** 1998 and Rosgen, Dave. 1994. ***Applied River Morphology.*** Wildland Hydrology, Pagosa Springs, CO.
    - ***cross-sectional survey***, ***plan view*** and ***longitudinal profile*** to determine current and created channel length, slope, width and depth of the bankfull channel, width to depth ratio and floodplain access ratio, bankfull cross sectional area, bankfull discharge, mean bankfull depth, max bankfull depth, width of flood-prone area (entrenchment ratio), mean bankfull velocity, shear stress pounds per square foot and stream competence (largest particle a stream is moving during a bankfull event), water surface slope and channel sinuosity and Rosgen Channel Type.
    - Pebble counts to determine current distribution of particle sizes in the active channel
- Rosgen Bank Erosion Prediction Assessment (Level 3 – Assessment of stream condition and departure from its potential) (page 5-54 of Rosgen, Dave. 2006***, Watershed Assessment of River Stability and Sediment Supply*** *(WARSSS)*
    - Using 2 bank erosion estimation tools to (bank erosion hazard index and near bank stress assessment) to determine increase or decrease in the actual erosion of the bank.
    - Annual erosion rates are estimated; multiplied by bank height and by the corresponding bank length of a similar condition providing an estimate of cubic yards and tons of sediment per year.
- Vegetation Surveys to determine baseline species diversity and numbers
    - Three Jornada line-point intercept vegetation cross-sectional transects and one parallel transect down existing channel (Herrick, J. C.; Van Zee, J. W.; Havstad, K. M.; Burkett, L. M.; Whitford, W.G. 2005 *Monitoring* ***Manual for Grassland, Shrubland and Savanna Ecosystems Volume I: Quick Start.*** USDA-ARS Jornada Experimental Range, Las Cruces, New Mexico.)
    - Three Jornada line-point intercept vegetation cross-sectional transects for the new channel
    - Green-line surveys on each bank of existing and new channels (Winward, Alma H. **Monitoring the Vegetation Resources in Riparian Areas.** 2000. US Department of Agriculture, Forest Service, Rocky Mountain Research Station, Gen. Tech. Report RMRS-GTR-47)
- vegetation mapping to show current locations of vegetation on existing stream banks
- the establishment of permanent photo points (DeLasaus, Michael, George, Holly, and Philip Mainwaring. ***Monitoring Riparian Areas with a Camera.)*** and production of baseline photos to visualize how the abandoned channel responds to treatment by supporting a variety wetland species like sedges, rushes, willows, cottonwoods, etc. while stabilizing the eroding outside cutbank, and the functionality and evolution of the new channel

Gold Creek Baseline Monitoring:

- a Rosgen Level 2 survey (Morphological Description Survey)
    - ***cross-sectional survey***, ***plan view*** and ***longitudinal profile*** to determine current channel length, slope, width and depth of the bankfull channel, width to depth ratio

and floodplain access ratio, bankfull cross sectional area, bankfull discharge, mean bankfull depth, max bankfull depth, width of flood-prone area (entrenchment ratio), mean bankfull velocity, shear stress pounds per square foot and stream competence (largest particle a stream is moving during a bankfull event), water surface slope and channel sinuosity and Rosgen Channel Type.

- Pebble counts to determine current distribution of particle sizes in the active channel
- Vegetation Surveys to determine baseline species diversity and numbers
  - Three Jornada line-point intercept vegetation cross-sectional transects
  - Green-line surveys on each bank
- vegetation mapping to show current locations of wetland vegetation
- the establishment of permanent photo points and production of baseline photos to visualize how the channel responds to treatment, change in grade and the change in diversity and amount wetland species like sedges, rushes, willows, cottonwoods, etc.

Dates: September 2007- July 2008, depending on project implementation date.
Outcome: Monitoring plan, Rosgen Level 2 Survey Report, Rosgen Bank Erosion Prediction Assessment Report, Vegetation Survey Report, and Photo Documentation. These documents and books will be housed at The Quivira Coalition Office in Santa Fe, NM.

Task 4-C: Comanche and Gold Creek Treatment Implementation:

Comanche Creek: The proposed treatment for Comanche Creek is a high priority task. The need for channel realignment is urgent as the creek continues to encroach on a Forest Service Road (Appendix B, photo #1). The erosion produced by this encroachment is contributing large amounts of sediment to Comanche Creek adversely affecting RGCT habitat, spawning sites (photo #2) and Outstanding National Resource Waters (ONRW) designation. The short reach will be realigned to stabilize the eroding bank and promote streambank vegetation that will reduce streambank erosion, sediment load and stream turbidity and restore floodplain access to meet NMED's water quality objectives while restoring habitat for the RGCT.

The proposed treatment is to excavate a new channel and divert the entire flow of Comanche Creek away from the existing channel and into the new channel (Map B). The existing highly erodible streambank is contributing about 110 to 120 cubic yards of sediment per year to Comanche Creek. The cut bank (river right) cannot be stabilized effectively using available practices, therefore requiring the installation of a replacement channel. The dimensions of the existing channel, which will be abandoned and partially backfilled, are 294 X 12 X 2.5 feet. The existing channel is a compound meander bend with an average meander radius of about 24 feet. The dimensions of the constructed channel will be 152 X 12 X 2.5 feet. The meander radius of the new channel will be about 48 feet which is approximately equal to the adjacent meander bends in the existing channel. The newly created floodplain will help to protect the steep concave bank of the existing channel from erosive flood events. Sheer stress on the outboard (concave) bank of the new channel will be substantially less than stress on the existing bank. The newly excavated right bank will be stabilized by installing four post vanes (Appendix C - graphic #1) 6 X 12 feet with hypotenuse of 15 feet and by the existing dense stands of willows and sedges. The location of the vanes will be determined when excavation is complete. Because stream velocities will be accelerated over existing velocities (due to steeper channel slope), a rock weir will be installed at the next downstream riffle location to control stream bed elevation and prevent bed scour. Dimensions of the rock weir (Appendix C, graphic #3) will be 12' X 12' X 1' = 144 cubic feet.

Order of Work –

1. All survey stations shall be verified prior to construction; any differences shall be reconciled with actual channel dimensions.

2. Construct boulder weir with footers at station 3+85 (invert elevation at existing thalweg plus 12 inches).
3. Install temporary sediment filters at stations 4+50 and 3+50 (approximate locations).
4. Begin removing sedge/grass sod mat (100' X 12') from new channel location. **Temporarily retain a 5' wide barrier to separate existing channel from new channel to keep flow from entering the new channel until Step 7.**
5. Stock pile sod mats for future use at points X and X_2.
6. Begin dredging new channel proceeding upstream from station 3+45 towards station 0+40'. Stock pile dredged material at pointsY_1, Y_2, and Y_3.
7. When the new channel is fully excavated, remove barrier and divert entire flow into the new channel.
8. Using the stockpiled dredge material, back fill the natural channel to create a plug (35' X 12' X 2.5') from station 0+40 to 0+75. Fill to the depth of the floodplain minus 6 inches. Do not fill the natural pool at bend between station 0+75 and 1+00. In the future this pool will be sustained by alluvial groundwater.
9. Stream should now be flowing in the newly excavated channel. Use this opportunity to rescue any fish trapped in the abandoned channel.
10. Cover the fill with sod wads to an elevation level with the existing floodplain (requires approximately 42 square feet of sod wads/mats).
11. Install a channel plug between stations 1+00 & 2+00 using fill stockpiled at point Y_1 and Y_2. Dimensions of plug will be approximately 100' X 12' X 3' feet above the thalweg; modified as necessary to utilize all remaining materials dredged from the new channel. Station at confluence of existing and new channels on downstream section is 3+34. The existing channel between Station 2+00 and 3+34 will remain unfilled to retain a natural pool as a spur of the main channel.
12. Use remaining sod wad from point X_1 to complete the plug.

Gold Creek: On Gold Creek, a direct tributary of Comanche Creek, a road embankment and culvert will be removed and grade control structures installed to restore Gold Creek's floodplain access to reduce sediment and improve water quality for Comanche Creek (photo #3). This restoration treatment will be implemented as per the design outcome of Task 1-C.

Dates: July - September, 2008

Outcome: ***Comanche Creek:*** New location for existing channel with a larger meander radius, cutbank stabilization, reduction of sediment in the creek at project location and increase in diversity and quantity of riparian vegetation on the outside bank of the new channel and within the abandoned channel.

Outcome: ***Gold Creek***: increase in wetland vegetation around the project site, grade stabilization, return of unimpeded flow and floodplain access to Gold Creek, remove the threat of catastrophic failure of embankment, and allow return of fish passage.

Outcomes for Comanche and Gold Creeks will be measured as part of Task 6-C – follow-up monitoring.

Task 5-C: Education and Outreach: The on-going Comanche Creek Restoration Project has benefited from intense volunteer efforts from the general public, watershed groups, federal and state land management and environmental agencies and conservation organizations

We will organize and implement a two-day restoration project tour and demonstration workshop for the Comanche and Gold Creek Restoration project. Participants will study channel stabilization practices, riparian restoration techniques and gain hands-on experience by helping to implement new treatments or maintain those already in place. Project tours and workshops will be lead by Bill Zeedyk who will present the "whys" and "hows" of riparian restoration and its effect on stream channel morphology, vegetation and ecosystem function. Bill will be assisted by the associated sub-contractor, land owner/manager and Quivira Coalition staff.

Tours and workshops will be organized, publicized and implemented by The Quivira Coalition staff and open to the public free of charge. These activities will be posted on The Quivira Coalition website, publicized in the quarterly bulletin and through special mailings, in area newspapers and on local radio stations. The tours and workshops disseminate information about riparian health, stream channel dynamics, water quality, restoration and resource management strategies to private and government land managers and the public at large.

Dates: July-September 2008 or July-September 2009.

Outcome: A two day tour/workshops with 20–30 participants. Workshop success will be measured through participation questionnaires.

Task 6-C: Post-Treatment Geomorphology, Vegetation Monitoring, Photo Documentation, Maintenance and Mapping for Comanche and Gold Creeks. The following will be produced:

- Completed treatment map
- Treatment monitoring to determine maintenance needs or modifications to achieve project objectives will take place once a year.
- Permanent photo points established in Task 3-C, will be re-taken at the same time for the next three years of the project
- Follow-up geomorphology and vegetation monitoring will be conducted at the completion of the project in 2011 with the same personnel and sub-contractors as pre-treatment monitoring.
  - ***Comanche Creek Existing and New Channel Post-treatment Monitoring:***
    - Repeat of Rosgen Level 2 survey
    - Level 4 (Verification and Validation of Predictions) Validation of Erosion Predictions (to document the actual erosion rate and compare to the Task 3 estimates.
    - Vegetation Surveys will document changes in species composition and numbers such as Beaked Sedge, Nebraska Sedge, Baltic Rush, Native Clover, Bluegrass, Rubberweed, Smooth Brome, Scouring Rush, Arizona Fescue, Shrubby Cinquefoil, Coyote Willow, Slender Wheatgrass, Mint, Alder, Narrow Leaf Cottonwood, Peach Leaf Willow, Gooseberry
      - Repeat Jornada vegetation transects
      - Repeat green-line surveys
      - Re-map location of vegetation
    - Final re-take of baseline photos to visualize how the abandoned channel responds to treatment while stabilizing the eroding outside cutbank, and the functionality and evolution of the new channel.
  - ***Gold Creek Post-treatment Monitoring:***
    - Completed treatment map

- Repeat Rosgen Level 2 survey (Morphological Description Survey)
- Vegetation Surveys will document changes in species composition and numbers such as Beaked Sedge, Nebraska Sedge, Baltic Rush, Native Clover, Bluegrass, Rubberweed, Smooth Brome, Scouring Rush, Arizona Fescue, Shrubby Cinquefoil, Coyote Willow, Slender Wheatgrass, Mint, Alder, Narrow Leaf Cottonwood, Peach Leaf Willow, Gooseberry
  - Repeat Jornada vegetation transects
  - Repeat green-line vegetation survey
- Re-map location of vegetation
- Final re-take of baseline photo points to visualize how the channel responds to treatment by supporting a variety of species wetland plants like sedges, rushes, willows, cottonwoods, etc. while stabilizing the grade of the creek.

- The Quivira Coalition will continue photo monitoring for Comanche and Gold Creek three years after project completion (2012-2014) and will fund and implement a second round of follow-up geomorphological assessment and vegetation monitoring in 2014.
- ***Outcome of Monitoring for Comanche and Gold Creek:*** Data will show how treatments reduced sediment going directly into the channel from the eroding bank, improvement of bank stability, change in channel morphology and vegetation cover, change in channel grade and return of floodplain access.

Dates: Post treatment through June 2011.
Outcome: Comparison Reports for: Rosgen Level 2 Survey Report, Rosgen Bank Erosion Prediction Assessment Report, Vegetation Survey Report, and Photo Documentation. Document presenting information for maintenance and modification of structures and treatments to provide information for future projects, improve management practices. These documents and books will be housed at The Quivira Coalition Office in Santa Fe, NM.

Task 7-C: Project Administration, Reporting and Invoicing. Invoices, semi-annual and final reports will be prepared to document project status, improvements in key environmental quality indicators, and itemization of expenses. This task will be implemented by Tamara Gadzia and Michael Bain.

Dates: September 2007- June 2011
Outcome: Invoices for completed tasks, semi-annual and final reports.

9. Comanche and Gold Creek Restoration Project Budget: Below is a per task spread sheet of the proposed project budget. Personnel and subcontractor rates are on a per hour bases as follows:

Personnel:		**Contractual:**			
Michael Bain	$35	Bill Zeedyk	$85	Steve Vrooman	$60
Tamara Gadzia	$35	Steve Carson	$85	Deborah Myrin	$35
Sheryl Russell	$25	Van Clothier	$65		
Veronica Medwid	$25	Craig Sponholtz	$65		
Catherine Baca	$25				
Genevieve Head	$35				

Hours for each task includes prep-work, round-trip travel time, implementation, follow-up, and documentation reporting by project manager and sub contractors as needed.

Task 2-C Planning	***Personnel***	RERI Grant Funds
10 hrs	Michael Bain	$350.00

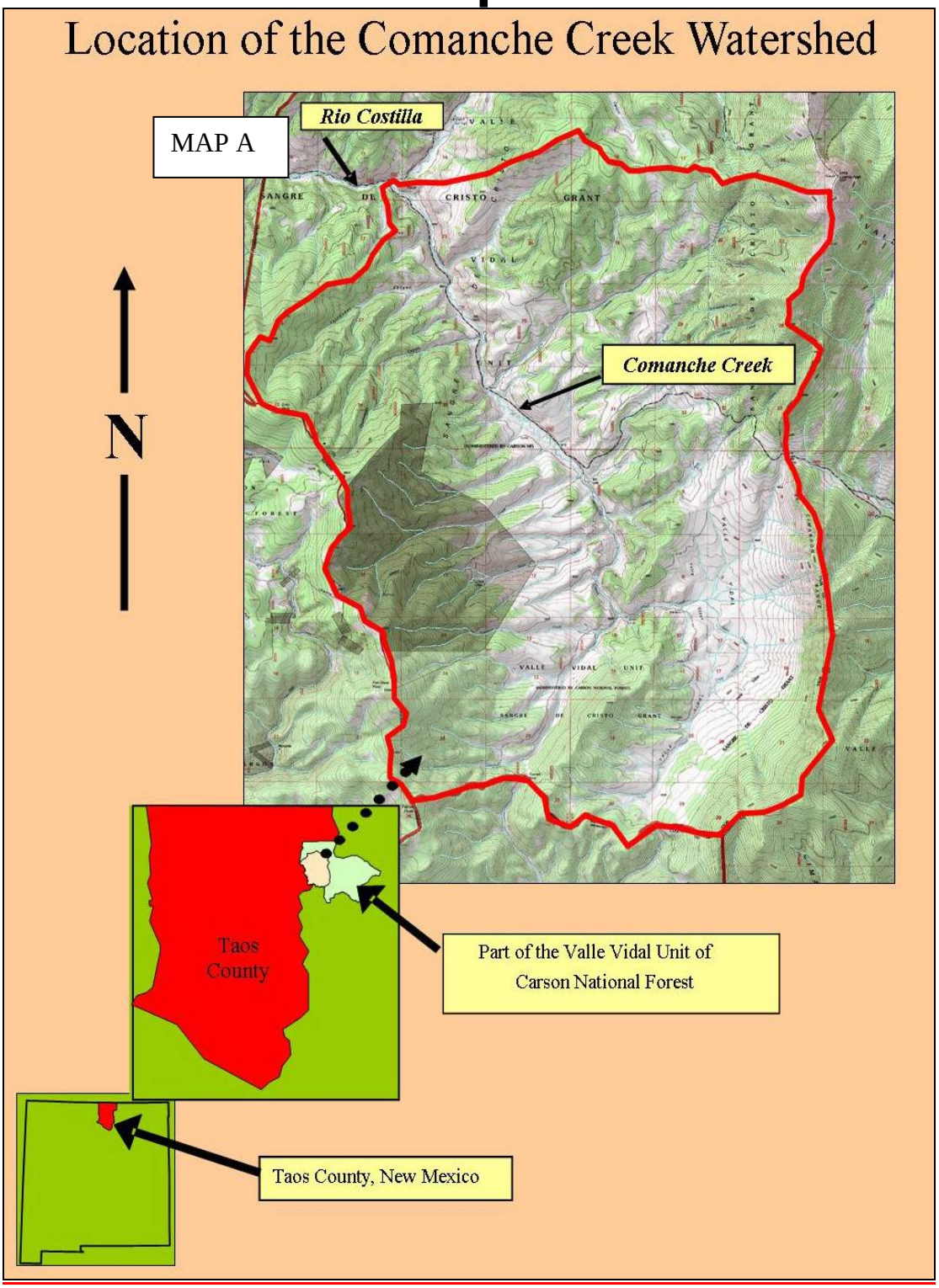
	Contractual	
10hrs	Bill Zeedyk	$850.00
10 hrs	Steve Carson	$850.00
10 hrs	Craig Sponholtz	$600.00
	Total	$2,650.00
Task 3- C 404/401 & archeology		
	Personnel	
10 hrs	Michael Bain	$350.00
	Contractual	
10 hrs	Bill Zeedyk	
		$350.00
Task 4-C Baseline Monitoring & Mapping, Reporting	***Personnel***	
30 hrs	Michael Bain	$1,050.00
30 hrs	Tamara Gadzia	$1,050.00
30 hrs	Gen Head	$1,050.00
	Travel	
1500 miles	Mileage	$480.00
	Per diem	$390.00
	Supplies	
	survey stakes, paint, flagging	$50.00
	Contractual	
10 hrs	Bill Zeedyk	$0.00
40 hrs	Steve Vrooman & Van Clothier	$2,400.00
		$6,470.00
Task 5- C Implementation of Treatments	***Personnel***	
70 hrs	Michael Bain	$2,450.00
	Equipment Rental & Transportation	$15,000.00
	Travel	
1350 miles	Mileage	$432.00
	Per diem	$702.00
	Supplies	
80 posts at $7.10 each	Cedar Posts	$560.00
	Fuel & Lubrication	$1,550.00
	Seed and mulch	$400.00
	survey stakes, paint, flagging	$100.00
	Contractual	
50 hrs	Bill Zeedyk	$4,250.00
100 hrs	Steve Carson	$8,500.00
100 hrs	Craig Sponholtz	$6,500.00

	Other	
	portable toilet	$500.00
	contractual overhead	$0.00
		$40,944.00
Task 6- C Outreach & Education	***Personnel***	
40 hrs	Michael Bain	$1,400.00
30 hrs	Tamara Gadzia	$1,050.00
50 hrs	QC Staff	$1,250.00
	Travel	
1500 miles	Mileage	$480.00
	Per diem	$468.00
	Supplies	
	posts, fuel etc.	$125.00
	Contractual	
30 hrs	Bill Zeedyk	$2,550.00
30 hrs	Steve Carson	$2,550.00
30 hrs	Craig Sponholtz	$1,950.00
	Other	
	portable toilet	$500.00
	postage and handling for flyers	$500.00
	printing for flyers and workshop materials	$483.00
25 X 16 hrs X $15 X	workshop volunteer participation	
		$13,306.00
Task 7-C Post Monitoring & Mapping, Reporting	***Personnel***	
60 hrs	Michael Bain	$2,100.00
30 hrs	Tamara Gadzia	$1,050.00
30 hrs	Gen Head	$1,050.00
60 hrs	QC Staff	$1,500.00
	Travel	
1500	Mileage	$480.00
	Per diem	$390.00
	Contractual	
10 hrs	Bill Zeedyk	$850.00
40 hrs	Steve Vrooman & Van Clothier	$2,400.00
		$9,820.00
Task 8-C Administration, Reporting & Invoicing	***Personnel***	
100 hrs	Michael Bain	$3,500.00
50 hrs	Tamara Gadzia	$1,750.00
	Total	$5,250.00
	Totals	$78,790.00

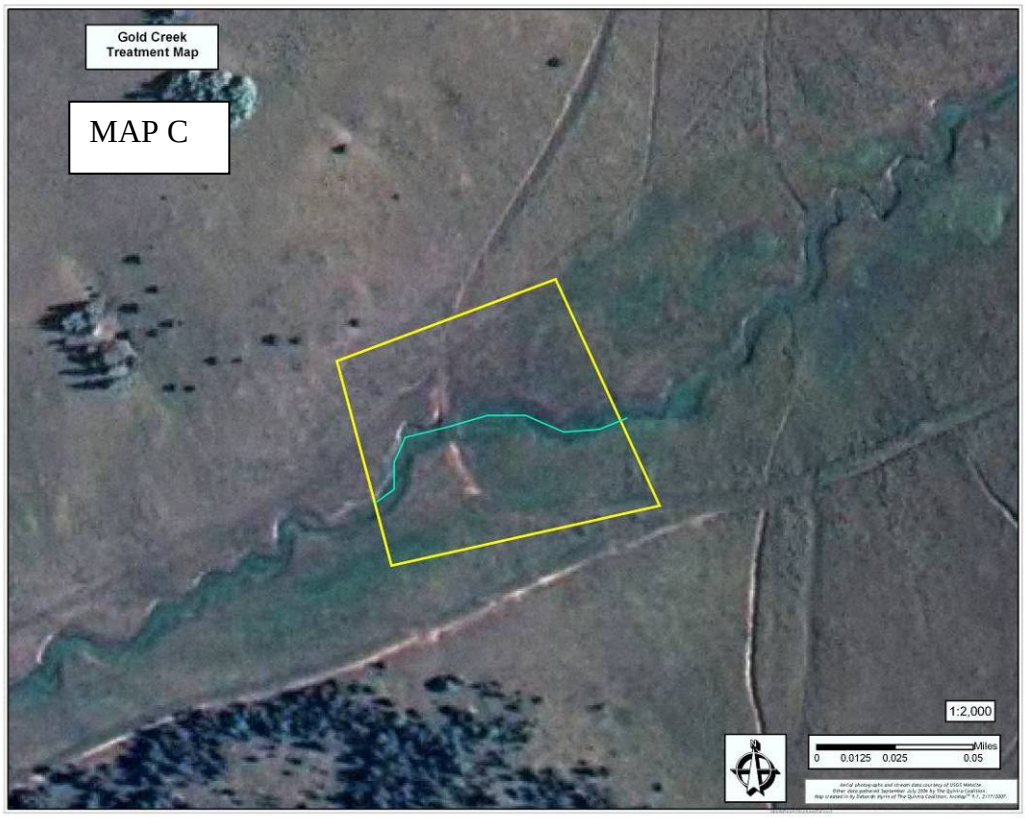
Category Totals	
Personnel	$20,950.00
Equipment	$15,000.00

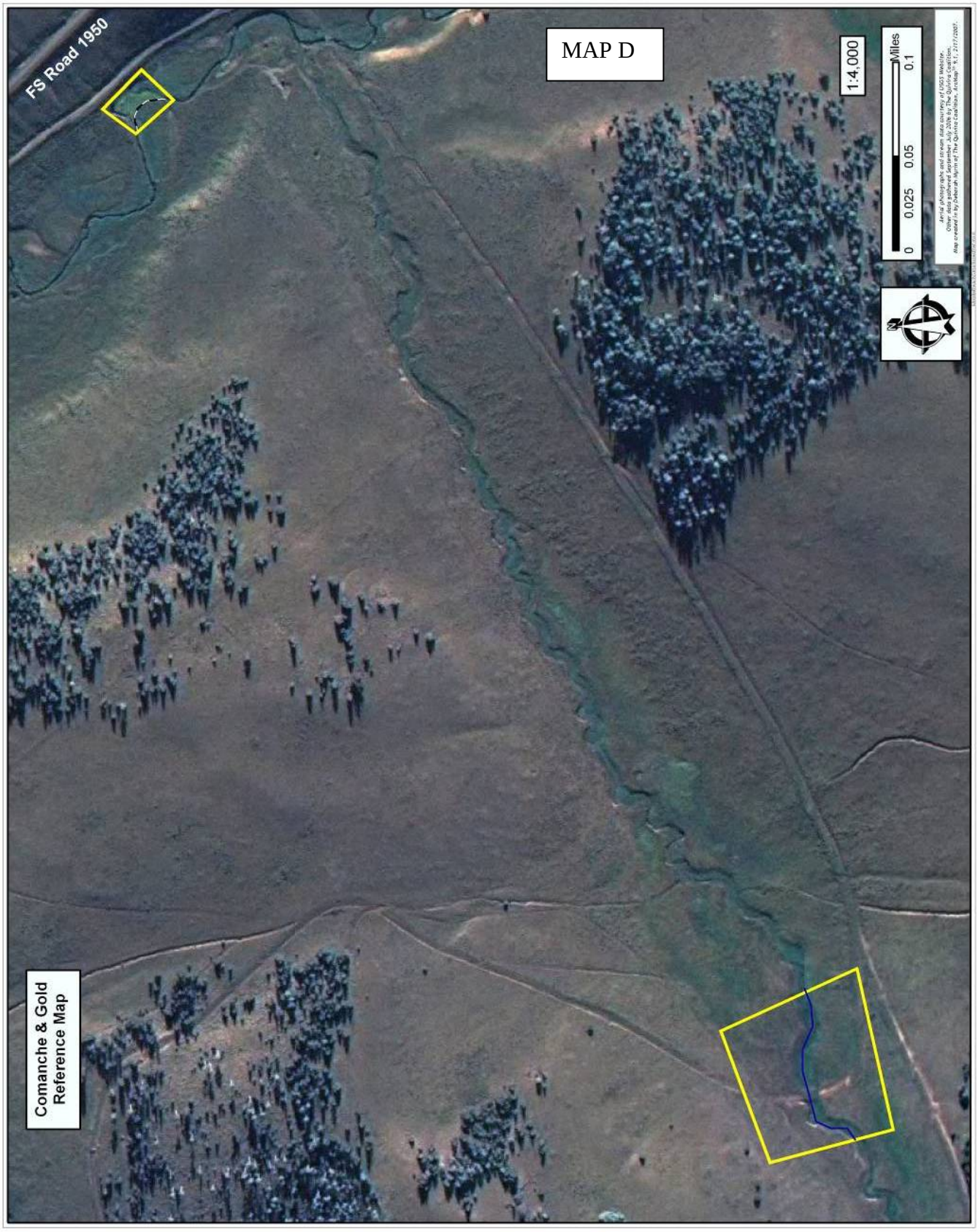
Travel	$3,822.00
Supplies	$2,785.00
Contractual	$34,250.00
Other	$1,983.00
TOTAL	$78,790.00

APPENDIX – A
Maps




MAP B
Comanche Creek
Legend
Existing Channel - 294 ft.
New Channel - 152 ft.
New Floodplain - Area = 6263
Middle Reach
Proposed Channel Realignment
FS Road 1950
Road
1:800
0 0.005 0.01 0.02
Miles
MR_Channel_Realignment.mxd


Gold Creek
Treatment Map
MAP C
1:2,000
0 0.0125 0.025 0.05
Miles


FS Road 1950
MAP D
1:4,000
Miles
0
0.025
0.05
0.1
Comanche & Gold
Reference Map

APPENDIX B – PHOTOS

Comanche Creek

Photo #1 **FS Road**

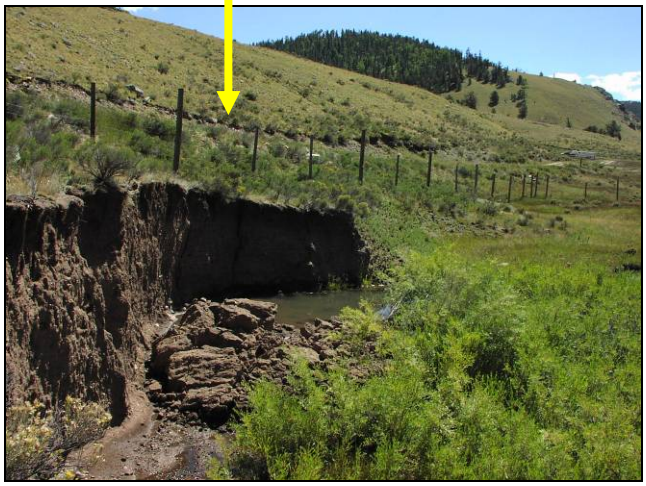


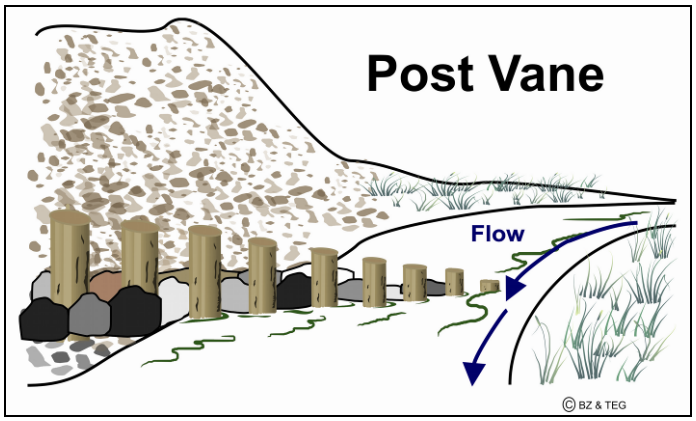
Photo #2

Photo #3

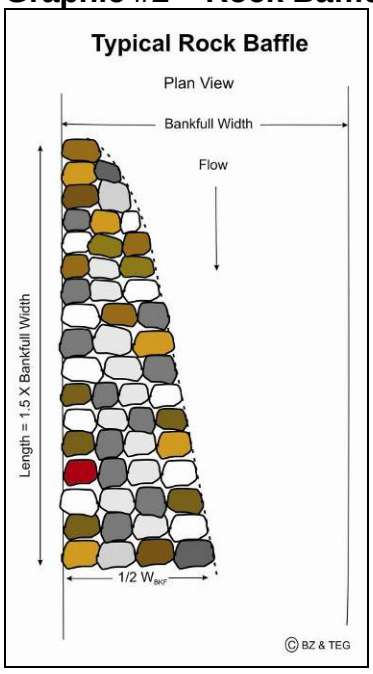
Mora River

APPENDIX – C Treatment Graphics

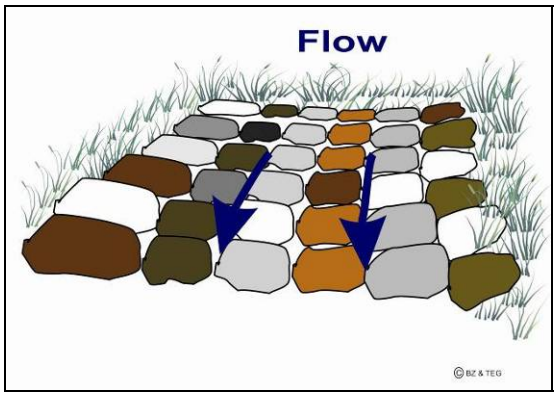
Graphic #1 – Post Vane



Graphic #2 – Rock Baffle



Graphic #3 – Rock Weir



APPENDIX - D
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APPENDIX – E
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