Final Report

Grant Number 09-163WPF

Double Circle Ranch Erosion Control Project

We successfully completed a total of four Erosion Control Workshops funded by the Arizona Water Protection Fund Commission and instructed by Craig Sponholtz of Dryland Solutions, Inc. This project included restoration of several drainages that feed either directly or indirectly into Eagle Creek by constructing small rock dams, media lunas, splash aprons, and armoring in the eroding gullies to catch silt and soil, thereby reducing channel sediment loading, increasing vegetation, and improving channel characteristics of the upland drainages. Each workshop addressed a particular type of erosion issue and a specific solution for it was developed to correct the problem. We used the numerous structures covered in our original *Site assessment and Construction Design Plan* performed for Task 2 for each site and constructed the structures using all volunteer labor other than the instructors. 75+ structures were completed during the workshops and our monitoring results emphasized how much improvement resulted from the volunteers efforts.

Our four Erosion Control Workshops were overwhelming successes which brought together people from all types of backgrounds for one purpose, showing how good conservation practices can be implemented on the ground in a fun, cooperative environment. We had a great deal of positive feedback from the diverse volunteers regarding the availability of public programs at the Double Circle which they felt was crucial for educating the public about environmental issues with hands on instruction while learning some valuable techniques for future use. We also conducted public tours of the ranch to showcase our example of a successful multi-agency and private sector approach to restoration of native habitats on a working cattle ranch. Restoration practices such as installing riparian fencing; constructing solar water pumping systems, using rotational cattle grazing, prescribed burning, and wildlife habitat seeding were presented.

We had a wonderful mix of hard working and inspiring volunteers who represented government agencies, ranchers, environmental activists, full-time water harvesters, and people who just wanted to learn how to fix a gully in their back yard. It was a great experience for everyone and hopefully opened some doors for future cooperative projects.

We appreciate the Arizona Water Protection Fund Commission for giving us the opportunity to improve our ranch habitat through hands on projects using diverse volunteers.

"The Arizona Water Protection Fund Commission has funded all or a portion of this report or project."

Construction Summary

We successfully completed a total of four Erosion Control Workshops funded by the Arizona Water Protection Fund Commission and instructed by Craig Sponholtz of Dryland Solutions, Inc. Each workshop addressed a particular type of erosion issue and the solution was developed to correct the problem. We used the numerous structures covered in our original *Site assessment and Construction Design Plan* performed for Task 2 for each site and constructed the structures according to their importance determined previously by Craig. By working in this order, any structures not completed due to time or labor constraints were less important to the overall plan. After the final workshop, we had constructed 24 structures consisting of 17 one rock dams, 3 rock bowls and 4 media lunas during the October, 2009 workshop, 18 structures consisting of 13 one rock dams, 3 rock bowls and 2 media lunas during the November, 2009 workshop, 18 structures consisting of 10 one rock dams, 1 rock bowl, 1 media luna and 6 post vane structures during the April, 2010 workshop, and we worked at two of the earlier sites and either repaired or added 26 structures consisting of 20 one rock dams, 4 rock (Zuni) bowls, and 2 media lunas during the final October, 2010 workshop As a result of all the participation by our volunteers during the 4 workshops, our monitoring has shown a reduction in sediment flow towards Eagle Creek thereby benefiting aquatic habitat, increasing water infiltration with subsequent benefits to the water table, and reduction of loss of productive soil which has increased forage for both livestock and wildlife.

The October 2009 workshop was designed to address erosion caused by runoff from an adjacent Forest Road which was causing major channelization and bank undercutting as the uncontained flow gained power. We hauled about 9 yards of hand sorted rock materials to a staging area at the site over 2 days prior to the workshop using our truck, tractor, and dump trailer. Craig and his assistant moved the rock to each structure site as needed using my dump bed 4 wheeler during the first morning of the workshop and began the instruction phase of the workshop by explaining the layout of the particular watershed, the erosion problems, and the methods and reasons behind our structures to be constructed. Craig's methods are very well thought out and are derived from years of experience. Each rock in each structure has a particular way it should be placed depending on its purpose. Some are stacked, some dug in, some keyed to other rocks, and others placed as if in a jigsaw puzzle. None are simply "dumped" into place as is usually done. As the volunteers worked on their structures, Craig moved from site to site giving individual, hands on instruction to insure a quality end result. Each structure also had native seed from on-site spread under and throughout the rock work to aid in retaining sediment as the vegetative cover sprouts through the rock structure. Craig also moved people from group to group and to different types of structures throughout the workshop to insure they had an opportunity to learn each method we were using. As the end of the workshop approached, Craig and I walked the worksite and placed rebar at each photo point and monitoring point location as was determined during the design phase of Task 2. We feel the workshop was an overwhelming success which brought together people from all types of backgrounds for one purpose, showing how good conservation practices can be implemented on the ground in a cooperative environment.

Our second workshop, which was held in November 2009, addressed a different type of erosion which was being caused by the degradation of an existing structure installed several years ago. An existing wire gabion basket placed in a developing channel many years before by the USFS had begun to fall apart and flow events from above were eroding around the structure, causing it to become dislodged. Because the gabion was no longer containing the sediment flow, all of the sediment was moving downstream. During this workshop we first repaired the area around the existing gabion and added several other structures at that location to slow down the sediment flow. Below this site structures were placed according to our construction plan from Task 2 with the intention of further slowing the channelization previously started.

Materials were sorted and hauled to the staging area as we did for the October workshop using our truck, trailer and tractor. Approximately 9 yards of rock were used for the 18 structures we completed. The rock bowl structures at the first location were integrated with the portion of the existing gabion still intact to form a gradual set of "steps" to begin slowing the flow and loss of sediment at the initial point. Several one rock dams were constructed at direction changes along the channel to further slow the flow and divert sediment. The lowest point of the workshop site has a media luna structure which spreads any remaining flow out over a wide expanse and reduces sediment loss downstream.

Craig began this workshop with a short training session at the October, 2009 worksite and then moved to the November, 2009 site and explained the differences in the erosion problem and cause we faced. The rock materials, slope, vegetation and soils of the worksite were completely different for this workshop, which Craig addressed while explaining how we would build each structure type as it was adapted to our overall solution. As with the previous workshop, native seed gathered onsite was spread under and throughout each structure and the photo points and monitoring points were marked.

Our third Erosion Control Workshop was held in April, 2010. The April workshop was designed to address erosion caused by an adjacent two track road which was causing major channelization and bank undercutting as the uncontained flow gained power. The road ran down the center of part of the site increased the channelization and erosion process. We used both the structures covered in our original *Site assessment and Construction Design Plan* performed for Task 2 and post vane structures covered in our Task #2 amendment. We hauled about 8-9 yards of hand sorted rock materials to a staging area at the site over 3 days prior to the workshop using our truck, tractor, and dump trailer. Craig and his assistant moved the rock and posts to each structure site as needed using my dump bed 4 wheeler and Kubota tractor during the first morning (Friday) of the workshop and dug the trenches for the post vane structures. Craig began the instruction phase of the workshop that evening by explaining the layout of the particular watershed, the erosion problems, and the methods and reasons behind our structures to be constructed.

Craig began this workshop Saturday morning with short training sessions at the October and November, 2009 worksites and explained the differences in the erosion problems and causes

we had faced as well as our solutions. The volunteers for this workshop included several "repeats" from previous workshops who circulated among the newer volunteers and assisted Craig with instructions. The rock materials, slope, vegetation, soils and cause of the erosion at the April worksite were completely different for this workshop, which Craig addressed while explaining how we would build each structure type as it was adapted to our overall solution. He thoroughly explained the reason behind using the post vane structures to stop bank erosion and the methods used in the layout and installation of them. As with the previous workshops, native seed gathered onsite was spread under and throughout each structure and the photo points and monitoring points were marked as determined in Task #2. One rock bowl structure used at this location was integrated with a media luna to begin slowing the flow and loss of sediment at one initial point. Several one rock dams were constructed at direction changes along the channel to further slow the flow and divert sediment. The lowest point of the workshop site had several post vane structures constructed in a series designed to protect the eroding banks, divert the flow of water and create a new flood plain to slow down the sediment.

Our first three Erosion Control Workshops funded by the Arizona Water Protection Fund Commission were complete successes and because we were able to come in under budget, we were able to host a fourth workshop in October, 2010. We had a great deal of positive feedback from the diverse volunteers regarding the availability of public programs at the Double Circle Ranch. They felt our programs were crucial towards educating the public about environmental issues using hands on instruction while learning numerous valuable techniques for future uses. The opportunity to continue the training was provided by the Arizona Water Protection Fund Commission.

The final workshop addressed an issue determined to be very important in the overall scope of erosion control structures – maintenance. All of the structures in the previous 3 workshops were completed according to their importance in controlling erosion at each specific site. The October workshop was implemented to address maintenance issues at our previously completed erosion control structures by revisiting the previous worksites and either repairing damaged structures, adding additional layers of rock to sediment covered structures or adding new structures as needed.

Craig had been attempting to set up a workshop of this type for some time at other locations and when we came in under budget and had funds for 1 additional workshop it became a reality. We hauled about 8-9 yards of hand sorted rock materials to staging areas at the sites over 5 days prior to the workshop using our truck, tractor, and dump trailer. Craig and the volunteers moved the rocks to each structure site as needed using my dump bed 4 wheeler and Kubota tractor during the first morning (Friday) of the workshop and performed an overall assessment of the maintenance required at each site. It was determined that our November, 2009 and April, 2010 sites needed the majority of attention during this workshop due to the amount of sediment deposition and newly developed erosion sites at each location.

Craig began Saturday morning with a short training session at the November worksite and explained the differences in the erosion problems and causes we had faced as well as our solutions. He then expanded into the maintenance areas, showing the volunteers specific issues to look for and methods to be used to repair or improve the problem areas. We worked at the November site the entire day on Saturday, adding 3 rock bowls, 11 one rock dams, and 2 media lunas into the existing worksite. The majority of the structures were added as new layers to the existing ones due to sediment deposition which had occured from several rain events we'd had. The volunteers for this workshop included several "regulars" from previous workshops who circulated among the newer volunteers and assisted with instructions. The rock materials, slope, vegetation, soils and cause of the erosion at this worksite were completely different from the April worksite we worked at on Sunday, which Craig addressed while explaining how we would build or improve each structure type as it was adapted to our overall solution. On Sunday at the April site, he thoroughly explained the reason behind using the post vane structures in April, 2010 to stop bank erosion and the methods used in the layout and installation of them. As with the previous workshops, native seed gathered onsite was spread under and throughout each new structure. One rock (Zuni) bowl structure was added to a newly formed head cut at this site as well as several one rock dams which were constructed at direction changes along the channel to further slow the flow and divert sediment. The lowest elevation of the April workshop site had several post vane structures in a series designed to protect the eroding banks, divert the flow of water and create a new flood plain to slow down the sediment. They were working very well and required several new one rock dams to be constructed overlapping the sediment covered existing dams. Many of our volunteers had been exposed to erosion control prior to this workshop and felt that the maintenance training was well conceived.

We feel all four Erosion Control Workshops funded by the Arizona Water Protection Fund Commission were overwhelming successes which brought together people from all types of backgrounds for one purpose, showing how good conservation practices can be implemented on the ground in a fun, cooperative environment. We had a great deal of positive feedback from the diverse volunteers regarding the availability of public programs at the Double Circle which they felt was crucial for educating the public about environmental issues with hands on instruction while learning some valuable techniques for future use. Thank you for giving us this opportunity.

Public Outreach Summary

The Double Circle Ranch Erosion Control Project was very strong in public education and involvement. Our four Erosion Control Workshops funded by the Arizona Water Protection Fund Commission were overwhelming successes which addressed public education in 3 ways.

First- We used all volunteer labor other than the instructors. We had a 100+ person e-mail list of people who had previously expressed an interest in doing volunteer work on future conservation projects. All of these people had received an email notice about each erosion control workshop. We also placed ads in the local newspapers and placed workshop fliers in

Morenci, Clifton, Safford, Tucson, Silver City, and Phoenix. Various organizations including Greenlee County Search and Rescue, New Mexico Wild, the Audubon Society, Tracks, County Extension Offices, White Mountain Conservation League, the Quivera Coalition, and Coronado RC+D put our workshops in their newsletters or verbally spread the workshop information. The results were that the each workshop had a minimum of 18 volunteers and several had 30+ volunteers. We learned that there was a good supply of people wanting to learn conservation practices and volunteer to put the practices on the ground.

We did not target a specific audience, but instead we sought a broad range of diverse persons. Having a group with diverse backgrounds, ages, employment, and interests provided an additional learning tool as people who traditionally conflicted on issues learned to work side by side to complete a common goal. Our 1st erosion workshop we hosted was funded by ADEQ and included representatives from 3 Indian tribes, ranchers, environmental groups considered quite radical, BLM and USFS employees, university students, retired people, engineers, archeologists, hydrologists, county road workers, and laid off mine workers. Everyone left with a greater appreciation of different viewpoints and learned some common denominators. Plus we completed 30 erosion structures- which at that time Craig Sponholtz considered a record.

Second- Not only were our volunteers completing worthwhile conservation work, they were being taught the tools to take home and work on water quality improvements in their backyards and in many cases in their jobs. People learned how to use easily available materials and no heavy equipment to build erosion structures on other sites. How much this accomplished is hard to quantify, but we had a questionnaire for each volunteer to complete after the workshops. One of the questions was – How will you be using the techniques learned? A majority of the participants answered the question enthusiastically. The amount of positive responses to the questionnaires reinforced our belief that there were a large number of people interested in participating in some type of conservation projects on the ground.

Third- Every volunteer that came to the Double Circle received a tour of ongoing and completed projects which were ongoing at the ranch. These projects represented the work and funding of many agencies and parties. The Arizona Water Protection Fund Commission was one of the partners. Others included ADEQ, ADA, Greenlee County, Coronado RC+D, NRCS, USFS, Quivera Coalition, Az G+F, USF+W, local ranchers, and more- including over 100 individuals who have spent their spare time helping make this ranch all it can be and a model for sustainable, conservation-oriented cattle ranching. One volunteer who participated in ADEQ's erosion workshop was the president of an organization which promotes removal of all cattle from public lands. He was so impressed with the work here at Double Circle that he asked us to come present a pro-ranch lecture explaining good ranching to his organization and how it complemented their goals of preserving open spaces and abundant wildlife. The ranch was also featured in an article in their annual booklet. We were thrilled to participate.

Our schedule for each workshop was quite simple. Volunteers arrived Friday afternoon in time to set up camp and meet for supper at 6:00pm. After supper, Craig presented a slide show or lecture explaining the why, where, and how of the erosion structures we constructed

followed by a question and answer session. We also presented an overview and description of ongoing ranch projects. Saturday was an early breakfast then a full day's work with hands-on training by Craig Sponholtz. Lunch was in the field to avoid travel time. After supper, we would take interested parties for a quick ranch tour highlighting various grant and personal projects as well as emphasizing our future goals. Sunday was an early breakfast, then back to work. After lunch, questionnaires were filled out and collected. Most volunteers continued working Sunday afternoon and left Sunday evening, but some chose to stay an extra night.

Perhaps our most popular workshop was our fourth and final Arizona Water Protection Fund Commission funded erosion control workshop we conducted in October, 2010. During this workshop, 32 volunteers completed 26 structures. This workshop was promoted as a "Maintenance Workshop" and was designed to teach participants the skills required to revisit the erosion sites/structures previously built and determine how well the structures performed and what additional structures could be built to improve on them. Craig devoted a good deal of time to hands on, individual instruction while explaining the results of our previous workshop efforts. After having several flow events at each site, we were able to see the actual effects runoff and sedimentation had on each type of structure. By stabilizing the banks and slowing down the water flow during large rain events using post vanes and different types of rock structures, we have shown reduced sediment flow towards Eagle Creek thereby benefiting aquatic habitat, increasing water infiltration with subsequent benefits to the water table, and reducing the loss of productive soil which increases forage for both livestock and wildlife. These benefits alone made the labor, time, and money invested very well spent. This workshop, along with the previous 3, was another overwhelming success which brought together people from all types of backgrounds; environmentalists, agency people, Apache tribe members, ranchers, homeowners, landowners, etc. for one purpose, showing how good conservation practices can be implemented on the ground in a fun, cooperative environment. The most asked question during this workshop was "When is the next one?" which speaks well of the overall quality and experience we presented.

The greatest benefit from our series of workshops was one near and dear to our goals at the Double Circle Ranch. We wanted to develop a cooperative spirit in which good conservation practices could be implemented in a group effort with individuals who had frequently been at odds with each other. Too much time and money has been wasted fighting and disagreeing instead of working on common goals with respect for divergent opinions. We are very pleased both by the diversity of volunteers and the high degree of cooperation and respect shown by all of them. Our participants' ages ranged from in their teens to mid 70's. While a majority of our volunteers came from Arizona, others came from New Mexico, California, Illinois, and New York, from as far away as Los Angeles, San Diego, Santa Fe, Albuquerque, Chicago, and Antioch to as close as our next door neighbors. They ranged from retired folks to agency water professionals to Native Americans to housewives to students and teachers. We had a wonderful mix of hard working and inspiring volunteers who represented government agencies, ranchers, environmental activists, full-time water harvesters, and people who just wanted to learn how to fix a gully in their back yard. It was a great experience for everyone and hopefully opened some doors for future cooperative projects.

Final Monitoring Report Summary

After successfully completing a total of four Erosion Control Workshops funded by the Arizona Water Protection Fund Commission and instructed by Craig Sponholtz of Dryland Solutions, Inc., our monitoring efforts have shown a marked improvement in all aspects of the workshops. Fair rainfall totals for the previous year resulted in sediment deposition in and around our erosion structures. The consistent monitoring methods we used have shown this improvement through our measurements and actual photo points at the worksites emphasize the improvements. Each workshop addressed a particular type of erosion issue and the solution was developed to correct the problem. We used the numerous structures covered in our original *Site assessment and Construction Design Plan* for each site and constructed the structures according to on the ground instruction by Craig. As a result of the enthusiastic participation by our volunteers during the 4 workshops, our 4 years of monitoring records have shown a reduction in sediment flow towards Eagle Creek thereby benefiting aquatic habitat, increasing water infiltration with subsequent benefits to the water table, and an increase of productive soil which has improved forage for both livestock and wildlife.

Our monitoring methods were developed to be easily repeated and consistently performed each year. All sites had permanent photo point locations and permanent measuring stick sites to show the actual changes in depth and width of each monitored site to prove sediment deposition. Measurements of depth and width were taken and recorded at a predetermined location at each monitoring site and new photos were taken every November/December for the past 4 years to show the actual amounts of infill and revegetation that has occurred as a result of our series of Erosion Workshops. Equipment used to do the monitoring for this project was very simple – a GPS device, a digital camera, PVC pipes and rebar to mark locations, string, and a 50' measuring tape. All data and pictures were entered on standardized forms. In order to ensure accuracy, all monitored points and photo points had specific GPS coordinates and a natural landmark in the photos. PVC pipes and rebar were permanently installed. Doug Dressler of Double Circle Ranch did all the monitoring and reports in order to eliminate any inconsistencies.

Any information regarding the changes or improvements noticed while monitoring the sites was included in the narratives as well as the types of structures involved. The final year recordings were a definite improvement across the entire 3 workshop sites, mainly due to an increase in rainfall resulting in increased sediment deposition. Our normal yearly rainfall totals were 17 inches, but we had 12.2 inches the final monitoring period. Normal flows transported enough sediment to allow the previously begun healing processes to continue.

We have compiled a series of before and after photo pages to provide visual proof of the actual improvements for our Final Monitoring Summary. With 4 erosion workshop sites and over 75+ erosion structures completed by the volunteers, there are numerous opportunities to show exactly how much improvement resulted. We selected several of the larger more distinctive structures and areas which were representative of the workshops and the efforts to

improve sediment retention and reduce erosion effects. Each photo page includes a short description of the structure and area, but the actual photos speak for themselves.

Our monitoring methods and procedures were sufficient to record the improvements resulting from our erosion control efforts. However, several issues arose during our monitoring sessions which we would address if we were to implement another series of workshops. First we would use much more photography and photo points and less actual measurements to show the improvements. A series of photo points along the entire workshop site would provide "visual" proof of improvements, which people respond to much more positively. Second, monitoring using these photo points would be performed twice a year, after the spring and fall growing seasons. And third, rain gauges would be placed at each workshop site which would help explain variances in improvements between sites depending on rainfall totals.

April 2010 Workshop Site – Roadbed Erosion Location

An existing two track roadbed ran along this channel allowing a straight flow of sediment towards Eagle Creek (at base of the distant hills). Several structures, one rock dams and small rock bowls, were constructed along this site to slow and rechanneled sediment flow. The road was moved far to the left of this photo (out of the channel) to aide in the revegetation process.

The majority of evidence of the previous road bed has vanished in the new forage. The channel has moved to the left and flows to a series of post vane structures which slow and redistribute the flow. During the maintenance workshop in October 2010 we added a second layer of rock to the one rock dams along the roadbed which had been completely covered with sediment and vegetation. Flow at this site is spread out across the entire area as the channel has been completely filled in.

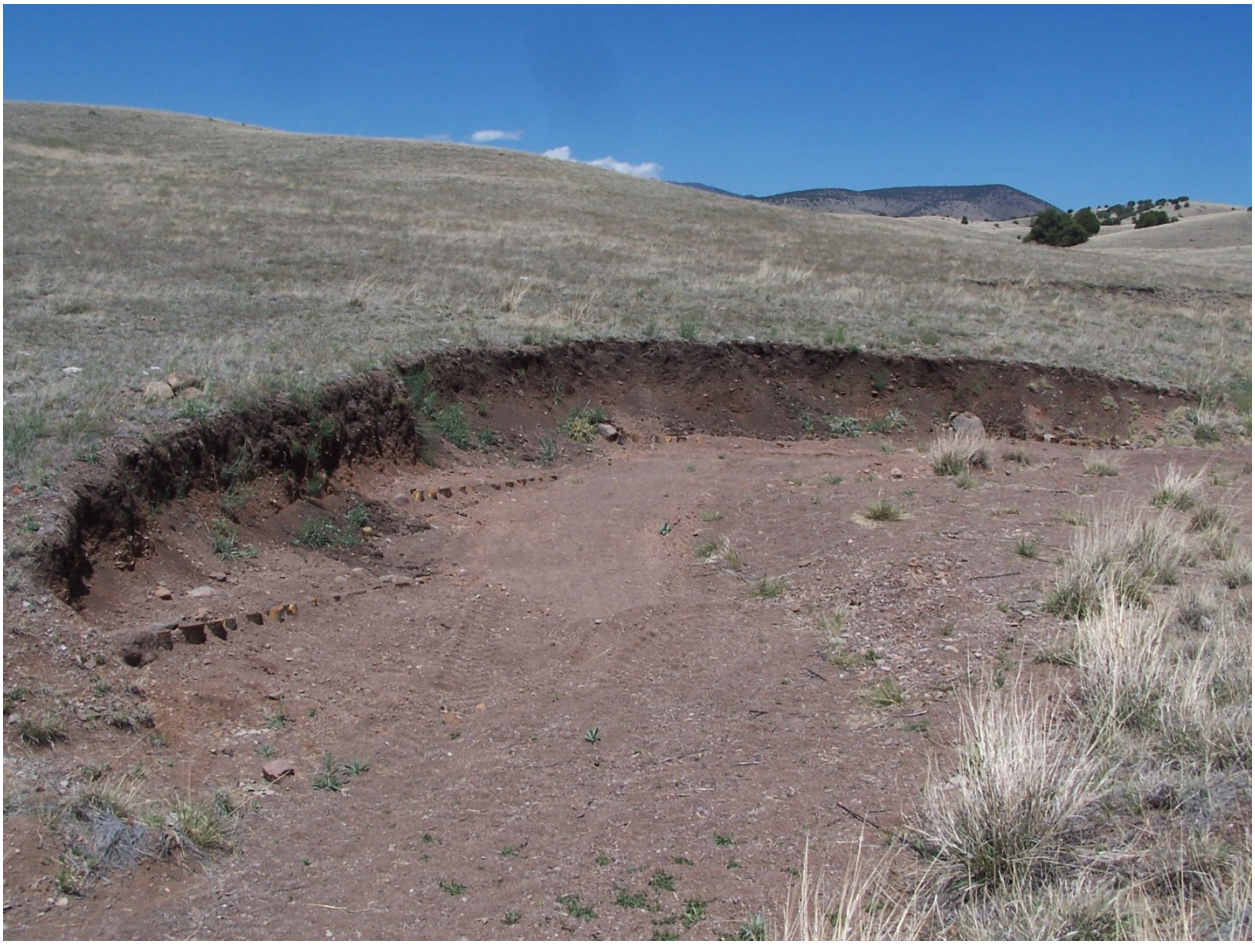
April 2010 Workshop Site – Zuni Bowl Location

This location featured a fairly large headcut travelling up a slight canyon. A large rain event would be extremely damaging to this type of site, causing additional erosion and sediment loss. A rock bowl (Zuni bowl) was constructed during the April 2010 workshop to prevent the headcut from extending further up the draw.

The completed rock bowl and a one rock dam should be sufficient for controlling future rain events. Notice how the structures have the rocks placed in a pattern, not randomly. The rocks interlock which will stabilize the structure as well as provide small crevices for sediment to deposit. A father and son team from California took this project on for themselves and had excellent results.

This recent photo of the Zuni bowl demonstrates the improvements in sediment retention and plant vigor. The upper end of the original headcut has ceased movement and the side walls have filled in the openings in the rockwork allowing soil stabilization and plant growth.

April 2010 Workshop Site – First Post Vane Location



Erosion of the cut bank at this worksite is ongoing and demanded attention. With the erosion caused by flow events around the gradual curvature of the channel this area would continue degrading further up the rise in the background. The post vane structures installed around the curve will move the flow away from the bank, arrest the flow velocity and allow revegetation along the edge.

After the post vane structures had aimed the flow events away from the bank, the healing process began. Vegetation has filled in behind the post vanes and the slowing of the flow has allowed sediment to be deposited inside the curve radius, promoting soil recovery and regrowth.

November 2009 Workshop Site – Large Zuni Bowl Location

Instructor Craig Sponholtz (standing in channel) explains the processes involved in repairing the existing wire gabion basket in the channel. The flow had cut around the basket and deepened the erosion causing extensive damage which would require a large rock bowl (Zuni bowl) and a series of one rock dams to begin healing the damage.

The completed structure consisted of 3 rock bowls in series with a media luna on the side. The elevation change of approximately 6 feet caused by the erosion required an extensive amount of volunteer labor which resulted in Craig's largest Zuni bowl constructed by hand. The structure "steps" down several times, which will allow sediment to deposit at several levels and eventually begin healing the damage caused by the wire gabion.

This is a fairly steep drainage fed by FR217 in several locations with a fairly large amount of flow during monsoon season, as evidenced by the amount of sediment deposited in the Zuni bowls. Revegetation is obvious and continuous with varied types of weeds and grasses. Sediment deposits of 12” – 15” were seen in the bowls which translates to much less sediment eventually flowing towards Eagle Creek. The entire drainage below this site was revisited during the Maintenance Workshop and extensive additions and repairs were added the entire length. The deep channel has virtually disappeared at the lower end of the site, further proving the value of the erosion control methods used.

October 2009 Workshop Site – Drainage Channel

The drainage channel addressed in the October 2009 Erosion Workshop extended from FR217G to Eagle Creek and was being eroded by runoff from the forest road. Numerous rock bowls, one rock dams and several media lunas were constructed by volunteers to slow the flow and capture sediment along the channel. Rocks are interlocked while constructing a rock bowl at this location.

Revegetation dominates the site in this recent photo as a result of slowed flows causing sediment deposition in the channel. This particular channel empties directly into Eagle Creek, which will receive much less sediment as a result of the erosion structures installed by the volunteers.

November 2009 Workshop Site – Overall View

The November 2009 Site was a popular location for training and maintenance over the duration of the workshops. The large amounts of flow caused by the drainage from 3 culverts off of FR217 resulted in deep channelization the entire length of the site and became a challenge to repair using hand built erosion structures. The site was revisited several times during subsequent workshops for additions and repairs which have resulted in the views in these photos. The initial deep channelization has been entirely filled in and several small media lunas are being used to spread any remaining flows across the lower portion of the site.

A second overall view showing the entire site. The original channel is for the most part filled in and the spreading of sediment at the lower end is obvious. This entire valley would have eventually eroded away without the structures installed by the volunteer workshos.