

## Final Monitoring Report – Summary Grant #11-176WPF

**We** have successfully completed an additional 3 Erosion Control Workshops funded by the Arizona Water Protection Fund Commission and instructed by Craig Sponholtz of Dryland Solutions, Inc. Combined with the 4 previously funded workshops our monitoring efforts have shown a marked improvement in all aspects of erosion control resulting from the workshops. Rainfall totals close to average for the previous years have resulted in increased 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 these 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 these 3 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 during the previously funded workshops 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 predetermined locations 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 latest 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 previously developed 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 and vegetation growth. Our normal yearly rainfall totals usually average 17 inches. We have been in drought conditions for

multiple years and have been well below average prior to 2012. Rainfall totals have been close to average the past 2 ½ years. Normal flows transported enough sediment to allow the previously slow healing processes to continue more rapidly.

**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 3 erosion workshop sites and over 55+ 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 before and after, but the actual photos speak for themselves. Also included are final graphs showing the actual monitored depths at each monitoring site for each workshop location. Using these graphs, we can see where sediment has been deposited or removed as well as prove the destructive force of large flow events such as Monitoring Point #2 at the October 2012 Workshop site. We also prove with our measurements that sites which are less incised with more gradual side walls heal much quicker than deeply incised sites. Heavier flow events have much greater velocity in these deeper sites.

**Our** monitoring methods and procedures were sufficient to record the improvements resulting from our erosion control efforts. Now that we have completed 7 total workshops and constructed over 130 structures, if we were to complete any additional future workshops we would change 3 areas of our monitoring protocol. 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 resulting from differences in rainfall totals.

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

*“The views or findings presented are the Grantee’s and do not necessarily represent those of the Commission, the State, or the Arizona Department of Water Resources.”*

## October 2011 Workshop Site – Grant #11-176WPF

### Overall View Before



**The** October 2011 workshop was designed to address erosion caused by a breached dirt tank dam spillway which was causing major channelization and bank undercutting as the uncontained flow from major rain events gained power. The breach was along the north edge runoff area of the dirt dam which assisted in the channelization and erosion. Three large rock bowl structures used at this location were integrated with 3 media lunas (rundowns) to begin slowing the flow and loss of sediment at the initial point, the breach location. Several one rock dams were constructed at direction changes along the remainder of the channel below the breach to further slow the flow and divert sediment.



## Overall View After



**The** three large zuni (rock) bowls constructed at this location to repair the spillway slope previously washed out when the original dam was breached have worked extremely well as is apparent in this photo. Volunteer labor and the correct use of larger available rocks for the structures has repaired the breached area and allowed extensive vegetation growth along this steep runoff area. Recent heavy flow events did no damage to this location, proving heavy equipment isn't always necessary where repairing larger erosion problems.



## April 2012 Workshop Site – Grant #11-176WPF

### Overall View Before



**The** April 2012 workshop was designed to address erosion caused by runoff from 2 side slopes at a major headcut which were causing major channelization and bank undercutting as the uncontained flow from major rain events gained power. The 2 slopes joined high on the hillside which resulted in their flows combining and contributing to the channelization and erosion. Several one rock dams were constructed at direction changes along the channel below the breach to further slow the flow and divert sediment for deposition along the channel.



## Overall View After



**This** location is at the top of a major headcut. The flow is first spread with a media luna, then the remaining flow is lessened by rock bowls and one rock dams. Vegetation along this section has improved greatly with the increased rainfall events. However the steeper area directly following this section is showing slight channelization due to the violent, heavy rain flows last monsoon season. The rock bowl and one rock dam structures below this portion of the channel were adequate at slowing the flow and arresting erosion during normal flows, but were slightly damaged during the heavy monsoons of 2014.



## October 2012 Workshop Site – Grant #11-176WPF

### Overall View Before



**The** October 2012 Site was at a popular location which had been one of the original workshop locations from our previous grant and was used for demonstrating training and maintenance methods over the duration of previous workshops. The large amounts of flow along the drainage from 3 major culverts off of FR217 caused by several heavy monsoon rainfalls resulted in deep channelization the entire length of this site as seen in this photo. The large amounts of runoff made it a challenge to repair the damage using hand built erosion structures. The site was repaired using a large, 75 ft. wide media luna placed just above the tree in the photo along with several one rock dams and rock bowls above the media luna. Several smaller media lunas were placed below this site as well.



## Overall View After



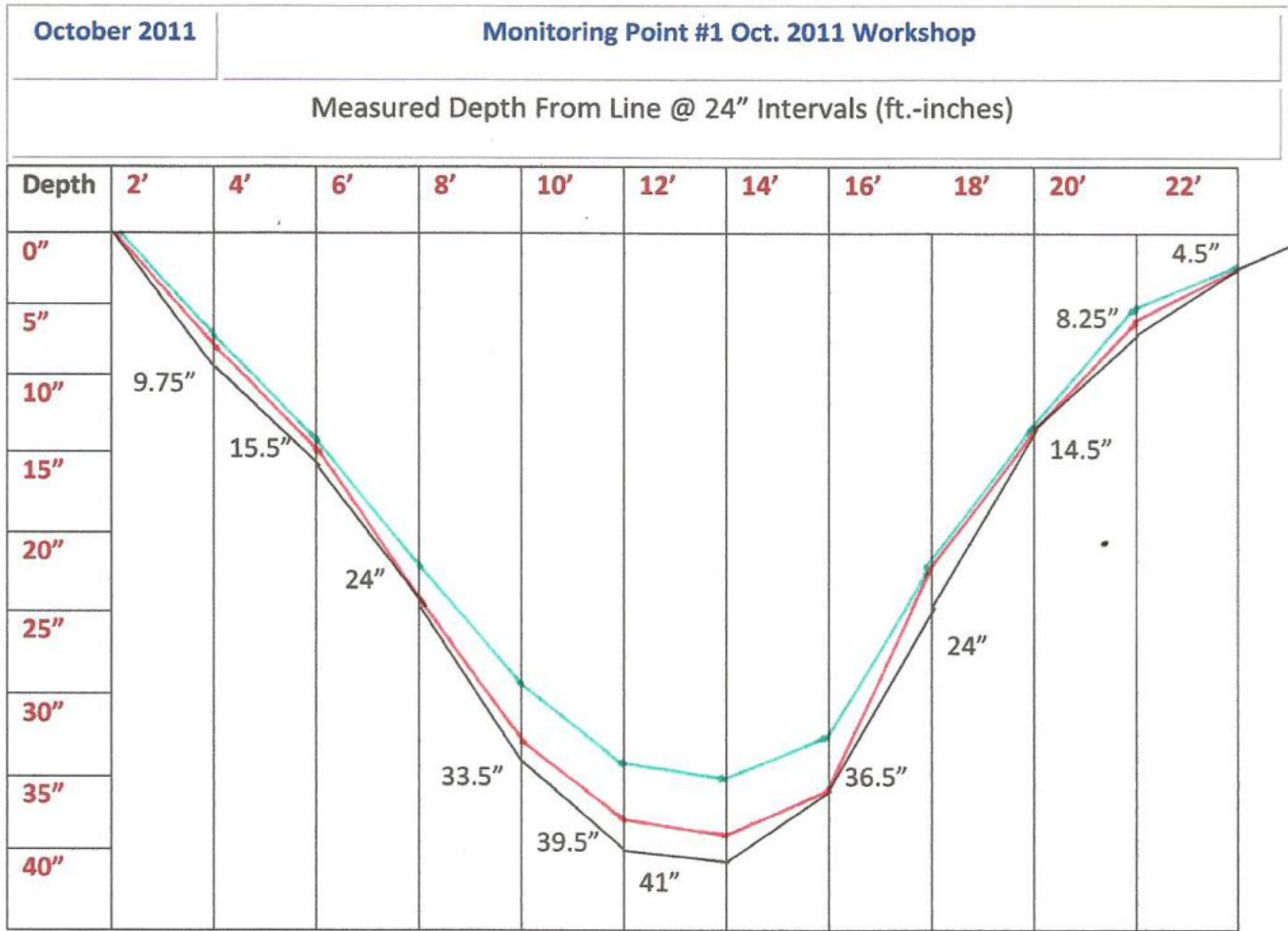
**An** overall view showing the October 2012 site 2+ years later. The initial deep channelization has been entirely covered and several small media lunas in the foreground are spreading any remaining flows across the lower portion of the site. As additional sediment is collected at this location, vegetation and ground cover should continue increasing.

The eroded channel is completely filled in and the spreading of sediment at this workshop location is obvious. This entire valley would have eventually eroded away and become a deep channel eventually emptying into Eagle Creek without the structures installed by the volunteer over several workshops completed at this site.



### Final Monitoring Results

- - 2012 Monitored Depth
- - 2013 Monitored Depth
- - 2014 Monitored Depth

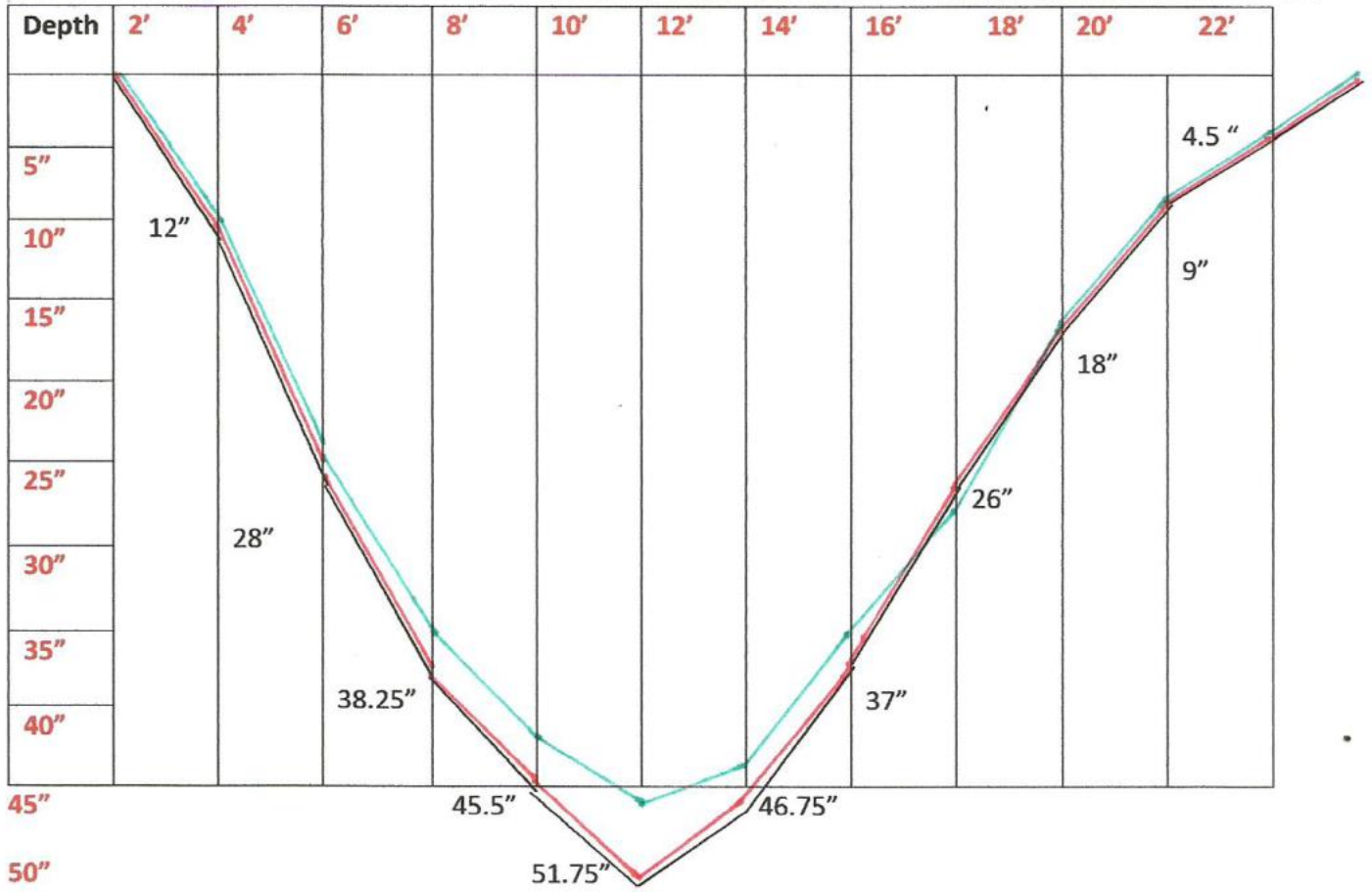


45"

October 2011

Monitoring Point #2 Oct. 2011 Workshop

Measured Depth From Line @ 24" Intervals (ft.-inches)







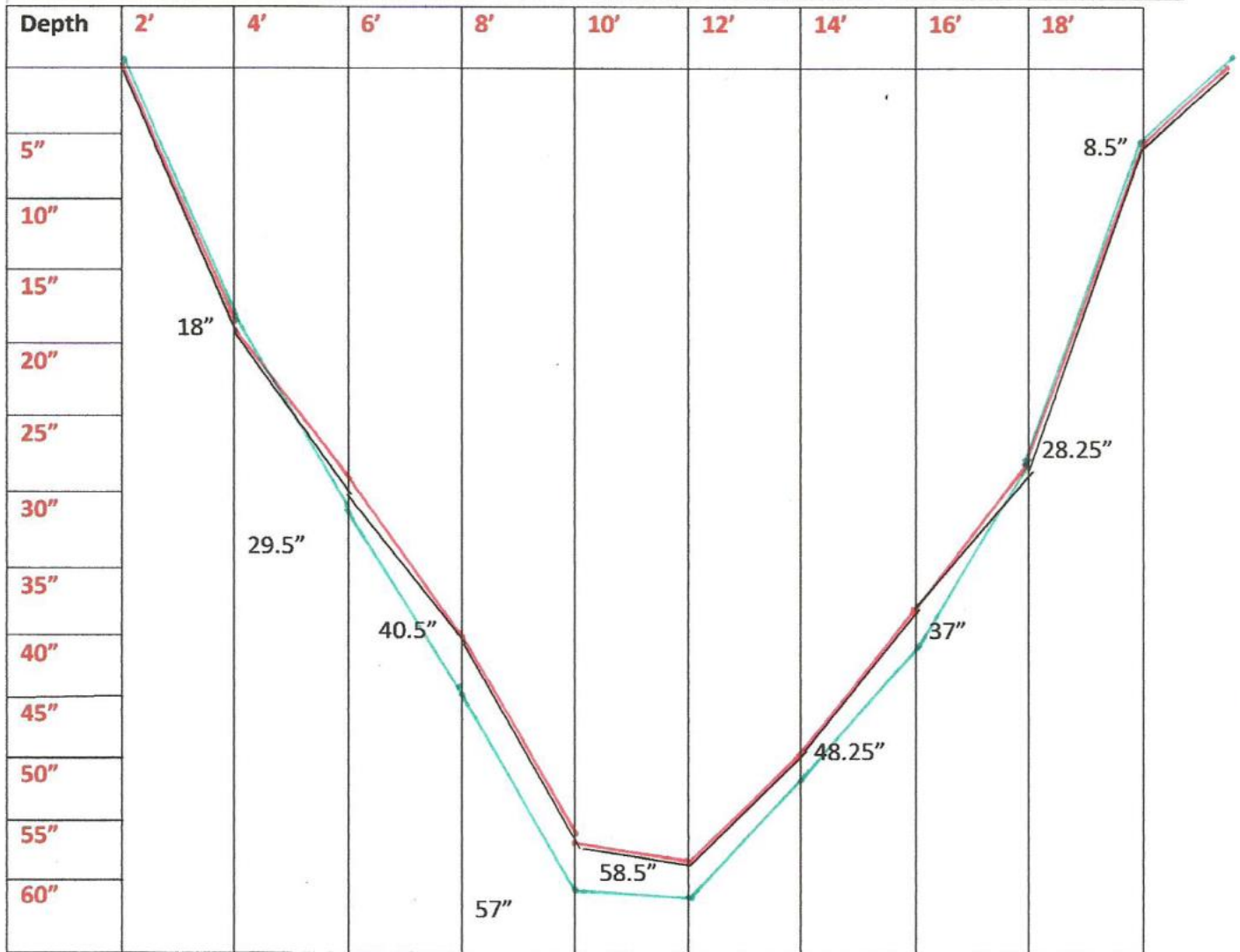




April 2012

Monitoring Point #2 April 2012 Workshop

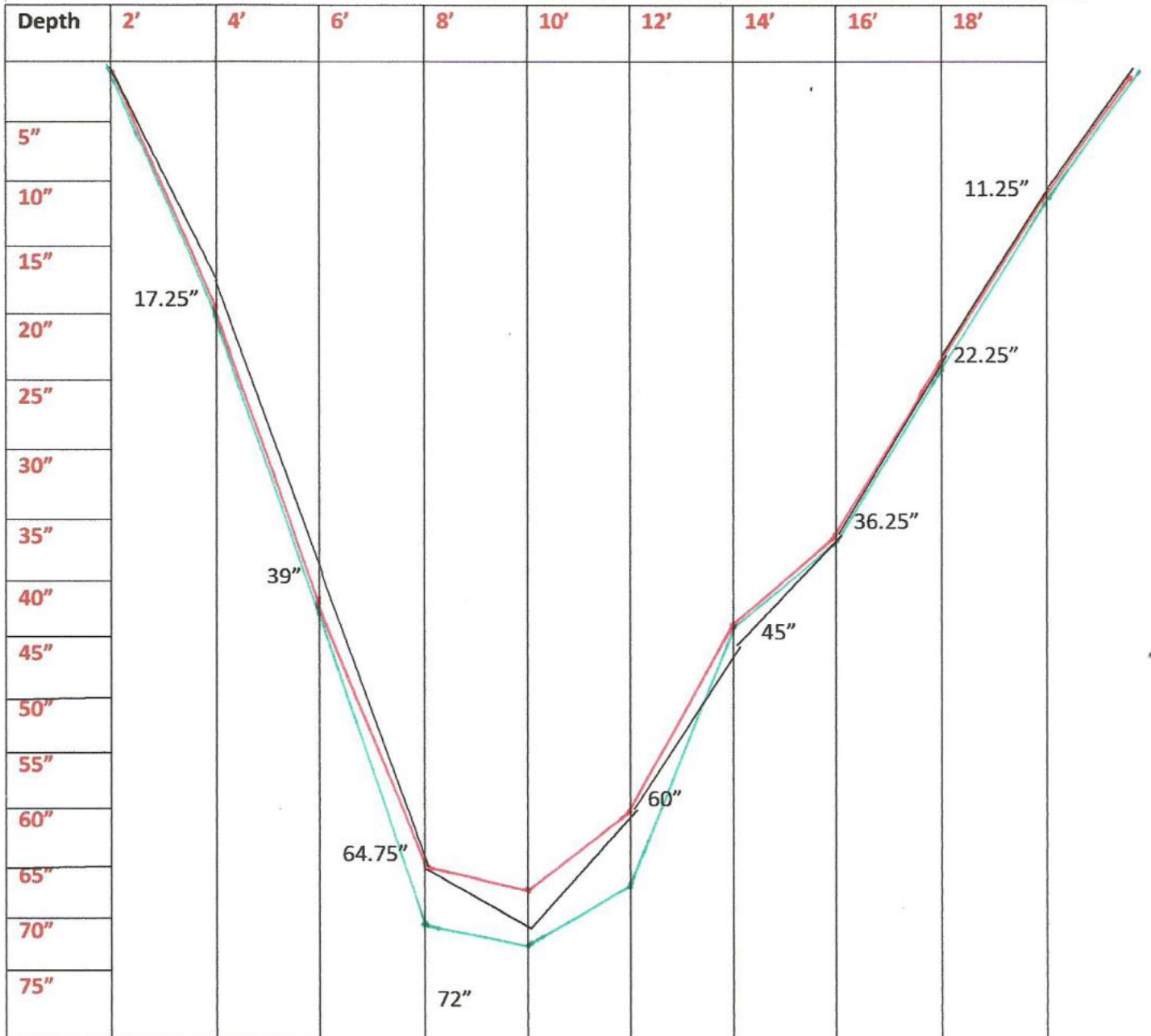
Measured Depth From Line @ 24" Intervals (ft.-inches)



April 2012

Monitoring Point #3 April 2012 Workshop

Measured Depth From Line @ 24" Intervals (ft.-inches)









## Final Public Outreach – Summary Grant #11-176WPF

**The** Double Circle Ranch Erosion Control Project funded by the Arizona Water Protection Fund Commission and instructed by Craig Sponholtz of Dryland Solutions, Inc. was overwhelmingly successful using volunteer participation to address public education in 3 specific manners.

**First-** As in our previous workshops, we used all volunteer labor other than the instructors. We had a 150+ person e-mail list of people who had attended our previous AWPf funded erosion control workshops or expressed an interest in doing volunteer work on future conservation projects. All of these people received an email flyer about each erosion control workshop several months and a few weeks prior to the 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 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 willing to volunteer to put these 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 proved to be an additional learning tool as people who traditionally conflicted on issues (such as ranching and the environment) learned to work side by side to complete a common goal. Our workshops included representatives from 3 Indian tribes, ranchers, members from several 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. The volunteers completed 55 erosion control structures during this series of workshops, totaling 130+ structures over the span of 7 total workshops- improvements on the land which would not have happened without the Arizona Water Protection Fund Commission funding.

**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 not rely on heavy equipment to build erosion structures on their own sites. How much this accomplished is hard to quantify, but we had a questionnaire for each volunteer to complete



after the workshops so that we could determine any ideas to improve future workshops. The amount of positive responses to the questionnaires reinforced our belief that there are 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 Ranch received a tour of ongoing and completed projects 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 150 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 one erosion control 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-ranching lecture explaining our ranching methods 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 dinner at 6:00pm. After dinner, 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 taken in the field to avoid travel time. After Saturday's dinner, we would take any interested participants 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. A summary of the questionnaires is included at the conclusion of this report. Most volunteers continued working Sunday afternoon and left Sunday evening and many chose to stay an extra night.

**Perhaps** our most popular workshop was our final Arizona Water Protection Fund Commission funded erosion control workshop we conducted in October, 2012. The majority of the volunteers present at this workshop were repeat visitors from earlier workshops who had heard that this was our final event. It was more like a "family reunion" than an actual workshop, with multiple stories about previous visits and "events" at the ranch workshops and discussions regarding sites and structures we had worked on over the years. This workshop, along with the previous 2, 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 common thing heard was that these workshops were the most fun and informative of any the people had participated in.

**The** greatest benefit from our series of 7 Arizona Water Protection Fund Commission funded 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' ranged in age from their early teens to their 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 conservation projects.

### **October 2011, April 2012, and October 2012 Workshop Questionnaire Summary**

**Please rate each of the following on a scale of 1 (poor) to 5 (excellent).**

**1. Content of Instruction**

5 # 4                      45 # 5                      2 # 10

**2. Quality of Instruction**

4 # 4                      48 # 5

**3. Quantity of Instruction**

9 # 4                      43 # 5

**4. Worksite Choice**

1 # 4                      51 # 5

**5. Amount of Field Work**

1 # 3                      2 # 4                      49 # 5

**6. Ranch Facility**

3 # 4                      48 # 5                      1 # 10

**7. Quality of Food**

2 # 3                      3 # 4                      45 # 5                      2 # 10

**8. Quantity of Food**

1 # 3                      2 # 4                      46 # 5                      3 # 10

**9. Overall Workshop Rating**

1 # 4                      49 # 5                      2 # 10

**10. Please describe how you will use the knowledge and skills gained in the workshop.**

\*When confronted with environmental drainage problems, I now know more fully how to assess the situation and develop an action plan for productive guided changes.

\*Home/back yard use and other private/small scale applications

\*Work on family land in Oracle. Repair dirt road with bad runoff/ erosion problems

\*I will look to perform these on an urban-set property experiencing erosion. I will also look to include the methods as part of academic studies. A larger discussion on off-site benefits and results would also be good.

\*Promoting use of LID/NDS and passive principles in city design projects and local watershed resolution

\*In SWPPPS- 1<sup>st</sup> hand knowledge of sedimentation and erosion control

\*I will use what I have learned to instruct and inform my own crews doing similar work. Craig was great at describing a big picture watershed context for the structures we were building & equally good at instructing on the finer points of constructing different structures.

\*Hope to work on a ranch someday



\*Last year was my first time doing the workshop, and I was able to implement the techniques and build structures on my own property. This year I built some new structures that I will take home and teach to friends and family.

\*The knowledge gained can be used on a daily basis in my profession. Facilities and instructor did a great job. The workshop was presented in a manner anyone could understand.

\*Present a lecture on erosion control at Shoreline Community College, Shoreline, Washington.

\*This being my second year/workshop, I learned much more site assessment and feature identification I can use this on my own property and as experience to help in employment opportunity.

\*I am planning on a career in conservation and restoration both of which will require knowledge of land management and erosion control. I will also use it when I come back to future workshops.

\*Greatly added to an area I was already very interested in. Intend to use these skills in the future-

\*Healing the West one rock at a time.

\*Lifelong lessons we will use on our land wherever we may be. Certainly the information learned has been above and beyond anything I have read in a book due to the hands-on experience.

\*Residential landscape. Pass on to students

\*I plan to implement the knowledge and skills gained in the workshop around my home and on the job.

\*I try to do these workshops throughout Southern Arizona and I hope to apply these skills to work in other workshops. I also believe a lot of these structures and holistic management skills can and should be applied in our urban settings and I plan to use this knowledge for this.

\*I had a great time and feel like we finished a quality project.

\*Going to work in my backyard.

\* I had heard about the workshop from a friend and it was great to finally put it all together firsthand. I gained a vast knowledge and new insight on erosion control. I will use this knowledge in my landscape and surely pass it on to my parents' house. They have erosion issues and this has given me a whole new outlook on how to fix it. Very useful ideas and concepts everyone will and should and know about.

\*I will apply this knowledge to other water restoration projects I will attend.

\*I've been to several workshops here and learn something new every time. This workshop was no exception. I do rainwater harvesting in the urban environment and the practices we learn here are often directly applicable to my work.

\*This knowledge will help my career in restoration and conservation. I can now train and monitor individuals who work for me in the field. The training directly relates to what I do every day.

\*This won't be an everyday knowledge to apply to my daily routine, but that is what makes the experience so special. For those friends with erosion in their yards, I will now have expert advice to give them!

\*Regrade our yard or any friends or families who would allow me to make changes on their properties. Maybe do some consulting with anyone interested.

\*Excellent workshop!

\*Will have a positive impact on my residential design projects. Gives me a more holistic way of thinking about landscape design.

\*As part of our youth -conservation corps, we will pass on the skills to advocate the future land managers of the southwest. The knowledge we have gained will be an invaluable resource for our project partners and enable us to expand our scope of work. Additionally, the chance to network with other people in the environmental community has been great! Thank you!

\*Use for future water conservation projects.

\*I hope to use in my job in habitat restoration – to enhance the quality of water management within the sites and the quality of habitat.

\*Looking to purchase a house in Tucson- would like to utilize techniques in landscaping and plan for water utilization. Would definitely like to participate in future workshops.

\*A big thank you to Craig. And a bigger thank you to Wilma and Doug!!

\*As always, Doug and Wilma were extremely gracious, the food was wonderful, and Craig did a great job! Thank you!

\*I will use this knowledge in the conservation of all land and any projects I work on. For example, water runoff on lands I work on. Overall a great learning experience.

**11. The Double Circle Ranch is in the midst of creating a sustainable ranching educational center and opportunities for individual and group learning. Please use the reverse side of this sheet to make facility and program recommendations.**

\*Wilma spoke of her plans for water harvesting opportunities off the buildings on the property and using that water for gardens and a few more fruit trees. That would be another good teaching course.

\*Back country workshops

\*Sustainable farming/ranching practices

\*Solar workshops

\*3<sup>rd</sup> time here- excellent!!

\*Class on rotational grazing and sustainable groundwater use

\*I was shocked and concerned that the local District did not have a representative present for at least one day. It would be beneficial to put on workshops on livestock handling if you don't already do so.

\*Facility: Could use one more port-a-potty, otherwise great facilities and campsites

\*Programs: For people 100% new, would be great to give more preliminary terminology and on first day keep lecture to 2 hours not 4.

\*Consider permaculture and holistic management as future teaching topics.

\*Good luck on the site. Use [www.wwoof.com](http://www.wwoof.com) to make yourself known to those wanting to help with any projects you may have

\*1. All aspects of solar- design, installation, operation, RV, thermal, H2o pumping and storage. 2 Off grid living- conservation, resource management, and energy harvest. 3. Micro-hydro energy

\*The facility and program were both wonderful. I was happy to have the opportunity to be a guest at the ranch and be a participant in the program. Thanks!

\*Rainwater harvesting and farming/orchards

\*Thanks again for another great weekend!! Looking forward to April

\*AWESOME! Have to give it some thought- would be hard to improve on excellence... maybe map of camping sites

\*Sustainable farming/ranching practices would be an excellent workshop.

\*4<sup>th</sup> time here- excellent!!

\*The facility and program were excellent. I enjoyed the chance to be a guest at the ranch and participate in the program. Thanks!

\*Everything was great.....top notch hospitality! The dogs had a great time as well! Thank you!

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**Double Circle Ranch Erosion Control Project**

**Grant # 11-176WPF**

**October 2012 Workshop**

**Monitoring Points Data Sheet #1**

<b>LOCATION</b>	Double Circle Ranch	<b>SITE GPS</b>	12S0642550/3686365 el. 4970'
<b>MONITORED DATE</b>	11/25/2014	<b>MONITOR</b>	Doug Dressler

**Photo MP#1**

**Comments**

**This point provides evidence the large media luna and zuni bowl are effective at slowing sediment loss. The monitoring shows the existing channel completely filled in with sediment. The structures have slowed the flow events from the 2014 monsoons and caused sediment from the USFS road to be deposited as well.**





**Double Circle Ranch Erosion Control Project**

**Grant # 11-176WPF**

**October 2012 Workshop**

**Monitoring Points Data Sheet #1**

<b>LOCATION</b>	Double Circle Ranch	<b>SITE GPS</b>	12S0642550/3686365 el. 4970'
<b>MONITORED DATE</b>	12/27/2012	<b>MONITOR</b>	Doug Dressler

**Photo MP#1**

**Comments**

This point was selected just below the large media luna and zuni bowl to show the effectiveness of these structures at slowing sediment loss. The monitored area includes the new channel being formed (foreground) and a slight depression (background), both of which are showing improvement resulting from the spreading of the flow events.









**Double Circle Ranch Erosion Control Project**

**Grant # 11-176WPF**

**October 2012 Workshop**

**Monitoring Points Data Sheet #1**

<b>LOCATION</b>	Double Circle Ranch	<b>SITE GPS</b>	12S0642550/3686365 el. 4970'
<b>MONITORED DATE</b>	11/25/2013	<b>MONITOR</b>	Doug Dressler

**Photo MP#1**

**Comments**

**This point provides evidence the large media luna and zuni bowl are effective at slowing sediment loss. The monitored shows the new channel being filled in with sediment (foreground) and the slight depression in the background showing no change. The structures have slowed the flow events and caused sediment deposition.**







<b>LOCATION</b>	Double Circle Ranch	<b>SITE GPS</b>	12S0642488/3686329 el. 4954'
<b>MONITORED DATE</b>	11/25/2014	<b>MONITOR</b>	Doug Dressler

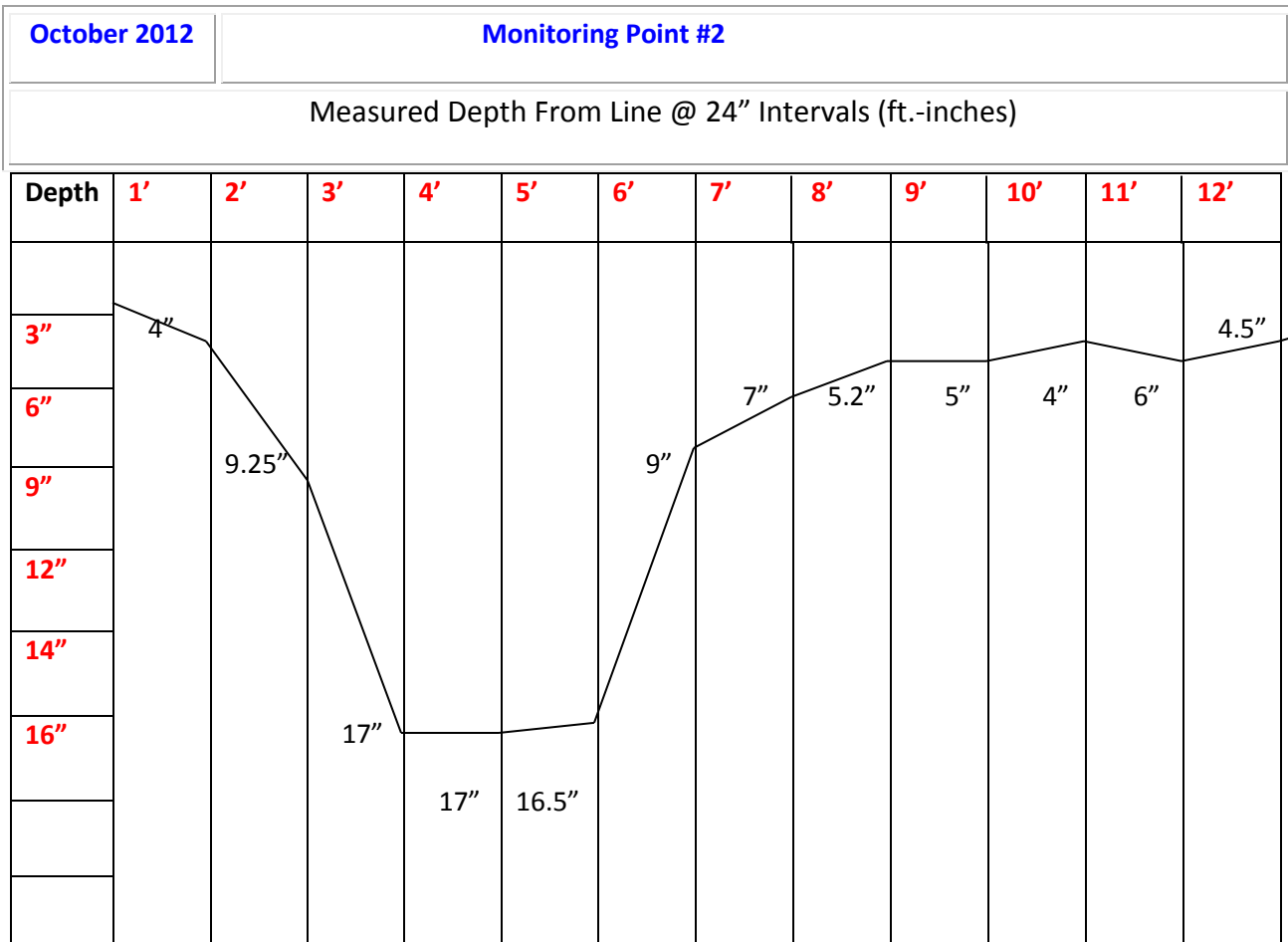
**Photo MP#2**

**Comments**

At the lower portion of the erosion worksite, several rock bowls and a series of one rock dams were constructed above this monitoring point to slow and disperse the flow. However, the large flow events from the 2014 monsoon season running off the USFS 217 road at the upper center of the photo did some damage to the structures. Deep channelization resulted, which should fill in after several normal rainfall amounts.



The measurements show a major channel formed by the large flows seen this season. Very large flows are reaching this area due to the heavy runoff from USFS 217.





<b>LOCATION</b>	Double Circle Ranch	<b>SITE GPS</b>	12S0642488/3686329 el. 4954'
<b>MONITORED DATE</b>	12/27/2012	<b>MONITOR</b>	Doug Dressler

**Photo MP#2**

**Comments**

At the lower portion of the erosion worksite, the single channel had spread to several finger channels. Above this location, several rock bowls and a series of one rock dams were constructed in an effort to slow and disperse the flow causing the sediment to be deposited and begin the healing process. As this site is monitored, the incised channels should eventually begin infilling from the sediment deposition.







**Double Circle Ranch Erosion Control Project**

**Grant # 11-176WPF**

**October 2012 Workshop**

**Monitoring Points Data Sheet #2**

<b>LOCATION</b>	Double Circle Ranch	<b>SITE GPS</b>	12S0642488/3686329 el. 4954'
<b>MONITORED DATE</b>	11/25/2013	<b>MONITOR</b>	Doug Dressler

**Photo MP#2**

**Comments**

**At the lower portion of the erosion worksite, the finger channels have begun infilling from the sediment deposition caused by several rock bowls and a series of one rock dams constructed above the site to slow and disperse the flow.**



