

**Targeted Watershed Grant in Torreon Wash  
Rio Puerco Alliance  
WS 96664601-0  
FINAL REPORT  
March 17, 2008-September 30, 2013**



*Community Planting Day, 2013. (Photo courtesy of Nik Gualco.)*

The Contract between the EPA and the Rio Puerco Alliance was signed March 17, 2008. The Rio Puerco Alliance (RPA) began the subcontracting process immediately, so that work could begin during the 2008 field season.

The status of tasks and deliverables is defined using the following terms:

**Completed** Objectives were achieved and deliverables are finished  
**Ongoing** Work is continuing

**Task 1. Erosion Control:**

**Subtask 1: Summer Youth Programs**

**Status**           **Completed**

**2008.** The Navajo Summer Youth Program started June 9, 2008 with eight students from Ojo Encino, Torreon, and Pueblo Pintado Chapters. The students were paid by the Navajo Nation and the crew chief, Ted Mace, was paid by RPA under the TWG. During the four-week session the students installed many “low-tech” erosion control structures along a section of the main Ojo Encino road where flooding has repeatedly damaged the road.

A second four-week session started July 21 with 10 students working along sections

of the model road being remediated under Task 2. The Second Session was held July 21-Aug. 7. One group of students and their supervisor, Lenora Mace, was paid entirely from Navajo Nation funds. The other group of students was paid from Navajo Nation funds but the supervisor, Rochelle Vandever, was paid from TWG funds. The first group worked entirely in the Ojo Encino area. The second group joined the first for a week and then moved to the Anthill area.

The TWG Steering Committee met with the students and viewed some work sites at the Anthill Road area. We offered suggestions and then invited them to a field trip with the RPMC to see other types of erosion control structures. Rochelle was a student at NMSU in Civil Engineering at the time (she has since graduated), so this was particularly useful for her. (See photos from the 2008 Summer Youth Program, and the Steering Committee field trip in Appendix 1.)

From Supervisor Rochelle Vandever's report:

"For the second group, the students worked in Ojo Encino and Anthill area. In the Ojo Encino area the main objective was to slow down the erosion that is contributing to the model road. The structures that are on the model road will be successful because the run offs are treated. . . .

"The site in the Anthill Project area needed to be maintenance due to the large rainfall. New ideas were suggested to control the erosion on a flat surface. The new site, Anthill Road Area was started, there needs to be more work done. The maintenance areas showed the students how the structures work and how the sediment builds up. . . .

"The students also had the opportunity to meet the people who made it possible for them to have a summer job. The first was an Outreach Meeting that was held at the Tinian Baptist Church. In the afternoon, there was field trip to the Anthill Project site. During the field trip, everyone had ideas to increase vegetation, decrease erosion, decrease the amount of bare land and fix the roads.

"The next opportunity was the field trip to Rio Puerco Management Committee project sites near Cuba, New Mexico. This field trip was held on August 5, 2008. The students met Mr. Michael Benson of the Navajo Nation Water Management Branch. The students were able to see other projects that were completed by their own peers. The day was filled with new information that could be used to treat the areas in the Outreach area and Ojo Encino area.

"Overall, the students learned a lot about the environment, grazing management and programs that help ranchers' restore their land. In the two weeks, five areas were treated. Five permittees benefit from the help of student workers and local community members. There are more areas in the Ojo Encino and Outreach area that can be treated with the low tech erosion control structures. There are many abandon roads that are eroding.

"In conclusion, I would like to thank all the people who made it possible for students to learn about erosion control. Also to Gilbert Yazzie who hauled rocks to make the job easier. I would like to thank the permittees who agreed to let the students work on their land. I would like to thank the students who continuously listened to me and the importance of the land. I met new students and new resources that are willing to help us restore and preserve our lands." [Note: I have left this in Rochelle's voice—it is typical of the way Navajos speak English.]

Rochelle detailed the number of structures that were built or maintained (110):

**RJ Area**

Maintained One Rock Dam	11
Maintained Zuni Bowl	1
Brush & Rock Dam	40
One Rock Dam	14
Contour Line	1
Zuni Bowl	2
Total	69

**MT Area**

Brush & Rock Dam	11
One Rock Dam	4
Total	15

**Anthill Road Area**

One Rock Dam	10
Total	10

**Anthill Site 1**

Maintained One Rock Dam	3
One Rock Dam	2
Total	5

**Anthill Site 2**

Maintained Contour Line	1
Total	1

**Anthill Site 4**

Maintained One Rock Dam	1
Contour Lines	2
Total	3

**Anthill Site 5**

Contour Line	1
Total	1

**Hardrock Area**

Maintained One Rock Dam	4
Maintained Contour Line	1
One Rock Dam	1
Total	6

The students learned about their environment and how to improve it. At a picnic held August 1, the students were asked to write about their impressions of their summer, while their parents cooked lunch. See Appendix 2.

In November, we lost our Navajo Coordinator, Ted Mace, and had to arrange for a new one.



*Rochelle and some of her students. (Photo courtesy of Watson Castillo.)*

**2009.** This year we had students paid for by Navajo Workforce and Ojo Encino Chapter Youth Employment Program (YEP) money. We started the crews on June 1.



*Working on structures. (Photo courtesy of Steve Fischer.)*

Craig Sponholtz gave a training June 1-3 at Ojo Encino for potential crew chiefs and supervisors—we had approximately 20 students, some from Ojo and some from Counselor. He gave them an overview of the subject and then spent the next two and a half days with them out in the field teaching them how to do various erosion control structures. After the Workshop there were two groups of students. The first group completed most of the work for the paired watershed monitoring areas, constructing 105

structures.

<b>R12 area</b>		<b>R10 Area</b>	
<b>Structure</b>	<b>Number</b>	<b>Structure</b>	<b>Number</b>
Headcut Layback	16	Headcut Layback	3
Zuni Bowl	2	Zuni Bowl	1
One-Rock Dam	65	One-Rock Dam	14
Media Luna	3		
One-rock Dam/Media Luna	1		

In the first group, we had five students from the YEP program for two weeks. We also had three students paid for by the Navajo Water Resources Branch and two paid for by Navajo Workforce.

The second group began work June 29. They completed work in the R12 area and began work in the site next to the R10 area. The second group had more YEP students and two from Workforce. We also had five students who volunteered their time. Navajo Workforce funds low-income students only and some applications were lost this year. YEP money from the Chapter covered some of those students. Rochelle Vandever, Ryan Yazzie, Tyffany Herrera, and Brandon were team leaders.

Craig Sponholtz came out for follow-up after his June 1-3 workshop. He was very pleased with the work he saw from the two groups of students and the structures laid out by the supervisors and Rochelle Vandever. (See photos from the 2009 Summer Youth Program in Appendix 3.)



*Workshop students in 2009 with teacher Craig Sponholtz (the tall one with the red beard!).  
(Photo courtesy of Steve Fischer.)*

**2010.** We had 13 students paid for by the Navajo Water Resources Branch under a grant from the Rio Puerco Management Committee. The Ojo Encino Chapter Youth Employment Program (YEP) did not have any money for us. Our students worked for eight weeks in June and July. The Ojo Encino Chapter did get some money from Navajo Workforce and hired another 13 students, who worked with our kids in July.

In addition, the BLM hired some of our students (those who were 18) to work in the area on erosion control for five weeks in August and September.

Part of their duties was to journal about the work. See Appendix 2.

Craig Sponholtz held his workshop June 1-3, 2010. He was very pleased with the work he saw from the students. In addition to the students from Ojo Encino, Pueblo Pintado, and Counselor, we had two natural resource staffers from Ramah Chapter attending.

Rochelle was interning at NAPI that summer but she and Craig Sponholtz worked with the new student supervisors to make sure they were comfortable supervising students and designing structures. They started work at R18 where they combined erosion control work with headcut work that will help ameliorate some road problems. (See photos of the 2010 Summer Youth Program in Appendix 4.)

**2011.** We received approximately \$20,000 in funding from the RPMC and BLM to pay summer youth in June and July. So we held another summer youth program and did more erosion control structures (and maintained the ones we had already put in) in the project area. River Source came out to teach the kids about vegetation monitoring under another RPMC grant.

RPA hired 12 students in FY2011, ranging from 14 years old to college age, and one supervisor. Most of the students were from Ojo Encino, although there were also students from Rincon Marques, Pueblo Pintado, and Counselor. The Water Management Branch and RPA were unable to get any other chapter to design an erosion control project in their area. Most were happy to send their students to learn about these low-tech methods on the ongoing projects at Ojo Encino.

Craig Sponholtz of DSI started the program by conducting a three-day erosion control workshop at Ojo from June 1-3, 2011, teaching the students to identify different types of erosion, survey land, and build erosion control structures such as one-rock dams and Zuni Bowls. Some of the training took place in the classroom, but most of it involved hands-on work outdoors. Several students had participated in the program in previous years. The workshop was paid for by the Quivira Coalition's Packard grant.

The students spent eight weeks building new structures in Range Units 18 and 1, as well as maintaining last year's structures. They helped Rich Schrader collect geomorphological monitoring data at the Ojo projects as well as at Bottleneck. They implemented an old trail/gully repair that Craig Sponholtz had helped them design. (See photos of the 2011 Summer Youth Program in Appendix 5.)



**2012.** Craig Sponholtz of DSI and Bill Zeedyk of Zeedyk Ecological Consulting started this year's program by conducting a week-long erosion control workshop at Ojo from June 4-8, 2012, teaching the students to identify different types of erosion, survey land, and build erosion control structures such as one-rock dams and Zuni Bowls (see photo above, at R1). Bill taught some new induced meandering structures that had never been used before by the summer youth crews. Some of the training took place in the classroom, but most of it involved hands-on work outdoors. Several students had participated in the program in previous years. The workshop was paid for under a contract with the Navajo Nation EPA (NNEPA).

The BLM gave RPA \$10,000 to supplement the NNEPA money for the Summer Youth Program. That enabled RPA to hire 15 kids plus 4 supervisors for 8 weeks. In addition, the BLM gave us an extra \$15,000 toward the end of the summer that enabled us to keep a crew on for two extra weeks. They worked in part to unearth the riparian plantings that had been inundated with sediment during a large storm. See Task 3, Riparian Restoration, below. They also did maintenance on erosion control structures affected by the storm.

The crews installed erosion control structures and used the new induced meandering structures in several places at Ojo Encino. (See photos and videos of the 2012 Summer Youth Program in Appendix 6.)

**2013.** We had three supervisors, two paid for by RPMC funds, and 12 students (paid for by NNEPA) constructing erosion control structures, maintaining structures built last year, and learning how to construct new types of structures, such as the post vanes that were installed in Torreon Wash under the direction of Bill Zeedyk (see Task 1b below). The program lasted eight weeks. We have funding from NNEPA for a further summer youth project in 2014. (See photos of the 2013 Summer Youth Program in Appendix 7.)

**Deliverables.** We leveraged funding from a variety of sources to keep the summer youth program going for the last six years. As a result, we have stabilized several sections of the project area watershed, using just rocks and kids. The kids installed over 2,000 structures and maintained older structures (i.e., placed another layer of rocks on them as the sediment backed up behind them). The paired watershed study shows (see Task 7) that our treated areas retained 60-66% more sediment than the untreated areas.

<b>Year</b>	<b>Source</b>	<b>Amount</b>	<b>Match</b>
2008	Navajo Nation (NN) Youth salaries	\$12,859	Yes
2008	NN WMB time + travel	\$10,305+\$2,068	Yes
2008	Parent from Pueblo Pintado+travel	\$2,816+\$517	Yes
2008	Headcut workshop participants+travel	\$1,840+\$644	Yes
2009	Ojo Encino YEP youth salaries	\$4,611	Yes
2009	NN WMB Youth salaries	\$3,090	Yes
2009	Travel from Sierra Club grant	\$773	Yes
2009	5 volunteer workers (120 hrs)	\$11,562	Yes
2009	Workshop Participants + travel	\$7,658+\$1,104	Yes
2010	NN WMB	\$9,846	Yes
2010	OE, Whitehorse, NN (cash for Youth)	\$19,809	Yes
2010	Travel from Sierra Club grant	\$207	Yes
2010	BRB Contractors for summer youth	\$1,000	Yes
2010	Workshop participants +travel	\$901+\$276	Yes
2011	NNWMB/RPMC	\$11,408	Yes
2011	BLM	\$10,000	No/Federal
2011	Quivira Coalition/Packard, Trainer fee	\$2,860	Yes
2011	Workshop participants +travel	\$4,505+\$1,380	Yes
2011	Watson coordination fee--RERI	\$3,012	Yes
2012	NNEPA	\$30,500	Yes
2012	BLM	\$25,000	No/Federal
2013	NNEPA	\$31,000	Yes
2013	BLM	\$10,000	No/Federal
2013	Watson coordination fee--RERI	\$6,486	Yes
2013	Plug and Pond Design KRE--RERI	\$2,842	Yes
2013	Plug and Pond Construction--RERI	\$19,060	Yes
2014	NNEPA	\$31,000	No/Pending
	<b>TOTAL rec'd</b>	<b>\$249,939</b>	<b>\$204,939</b>

### **Subtask 2: Headcut Work.**

**Status**            **Completed**

**2008.** As part of the TWG, Craig Sponholtz from Dryland Solutions, Inc. (DSI) taught a free two-day workshop on headcut control September 18 and 19, 2008 at the Ojo Encino Chapter House. This was a real hands-on learning opportunity with one of the most innovative watershed restoration practitioners working in the Southwest today.

Craig has a Master's degree in agro-ecological restoration. During his graduate work, he experimented with diverse approaches to erosion control. He worked with the Cuba High School Youth Conservation Corps crew in 2005 and 2006 using original methods to stop medium-sized headcuts. Craig came back to see how they worked and has continued to improve his techniques based on experience. This workshop was intended to expand participants' knowledge of watershed restoration and give them tools to use to improve their land. We had 12 participants, including a representative from Navajo EPA, and the incoming Ojo Encino Chapter President. Day 1 was background and then a trip to the field to assess an area for work the next day. On Day 2, the participants constructed several headcut-control structures. Participants learned that erosion most frequently begins and advances through headcutting. Headcuts are a real problem, drying out valleys, dropping water tables, and advancing ruthlessly upslope gobbling up productive land. We often look at them and wonder what can be done. Craig discussed practical ways to treat them (see photo below). (See more photos in Appendix 8.)



**2010.** We worked on headcuts in R18, R20, and R8 in connection with roadwork during 2010. Some of our kids from Subtask 1 and some of the Workforce kids also worked on an RPMC headcut project in the Bottleneck Watershed near Cuba. A grant from the RPMC paid for that work.

**2013.** Headcut work along Torreon Wash was designed and implemented this Summer under grants from NNEPA and the Torreon Wash River Ecosystem Restoration Initiative (RERI) from the State.

We originally contracted with Dryland Solutions, Inc. to do work under the RERI. We had taken a field trip out to the area originally contemplated for that work, which was around a well site on Torreon Wash that is used by area residents for both domestic and livestock watering. Navajo Nation EPA (NNEPA) came with us and said that we would not need NEPA for the area because it qualified for an agricultural

exemption. At this point, Craig Sponholtz became very busy and asked us to contract with Steve Vrooman of Keystone Restoration Ecology instead. We did. Then, before we could do any work, there was a major storm on July 5, 2012 that deposited great quantities of sediment along Torreon Wash and covered some of our plantings and knocked out the fencing. We did not think that we had enough money to do the work in the well area as it had been damaged further in the storm, so we decided to work on other headcut sites. We took a field trip with Steve and Weston Castillo of West Construction to prioritize potential treatment areas. In the meantime, the NNEPA decided that the original site was too important not to work on, so they found money from a tribal 319 grant they had and contracted with Bill Zeedyk of Zeedyk Ecological Consulting to design a repair. That repair involves three sets of post vanes at the well site and above and below the site. The work at the well site was partially completed this Summer with some help from our summer crew.



*Post vane under construction. (Photo courtesy of Tom Morris, NNEPA.)*

We prioritized three upland areas for work and decided to work on the third site. Weston constructed a plug and pond per Steve Vrooman's design in May. A "plug and pond" technique is where the headcut can be ponded and the channel returned to a higher elevation historic channel without risking downstream erosion. The ponding will also saturate the headcut, growing vegetation and preventing the headcut from continuing upstream. The area we chose has the potential for rewetting a large pasture in addition to preventing a worsening headcut. We established photopoints for future monitoring. (See photos in Appendix 9 and below.)





*Plug and pond, pre-, during, and post-construction. (Photos courtesy of Nik Gualco.)*

**Deliverables.** Headcut workshop. Headcut work at several sites.

## **Task 2: Roads**

### **Subtask 1: Roads Assessment**

**Status**            **Completed**

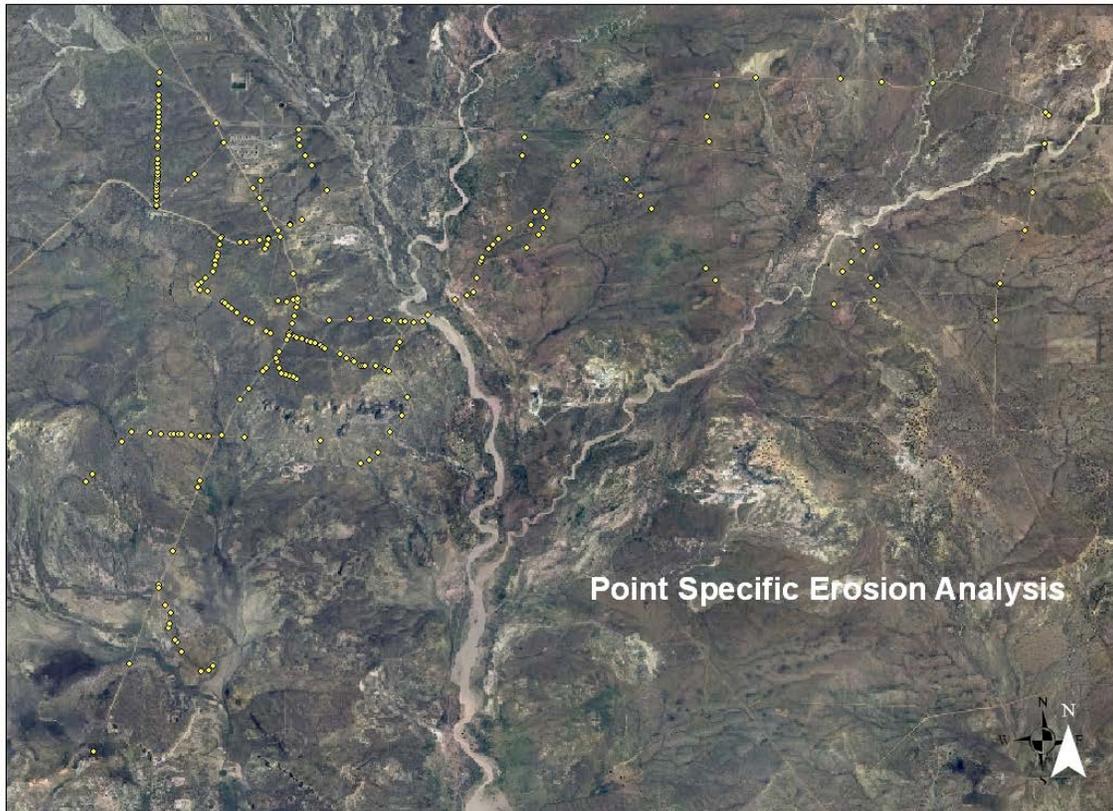
Krista Schultz, a graduate student at UNM, conducted an assessment of the erosion potential from roads in the Ojo Encino area by using the hillslope WEPP model. This was part of her work toward a Master's degree.

#### **“Modeling Road Erosion in the Upper Torreon Wash: Coupling GIS and WEPP to Predict Sediment Detachment, Transport, and Delivery**

“Accurate prediction of sediment detachment, transport and delivery from road networks has historically been an expensive and time-consuming task. The Water Erosion Prediction Project (WEPP) soil erosion model, allows users to predict road erosion based on specific characteristics. The approach can be applied to specific climate conditions, multiple road designs, and unique attribute information. The methodology is applied to the upper Torreon Wash located in northwestern, New Mexico. Main roads and access routes within study area are evaluated to determine the estimated sediment delivery from unpaved roads. This study incorporates results from the WEPP model to determine what impact erosion is having on the area. Analysis is designed to identify areas of intense erosion, sediment delivery to stream systems, and a case study to determine the effects of past remediation efforts. Collected data is stored and organized using geographic

information systems (GIS) to visualize the spatial component, while providing effective data management, analysis, and mapping capabilities within a geographic environment. The Upper Torreon Wash is experiencing severe erosion and findings suggest that remediation efforts can have a significant impact on reducing sediment loads from existing road networks.”

This is a map of the areas assessed. It indicates 100% of the data points for all the roads where work was completed under this grant. Where they are tight together is where most of the remediation work was done.



Krista conducted the above assessment of the erosion potential from roads in the Ojo Encino area to indicate “hot spots,” or areas that should be considered priorities for work. She then re-assessed the roads that were worked on under Subtask 2. According to her conclusions:

- ❖ The results showed significantly less erosion in almost all cases (Table 3). Data suggested that an average of 48% of road erosion was reduced, while 51% was prevented from passing over the adjacent landscape, where it could contribute to a field or stream system.

Table 3. Percentage of Sediment Reduction.

<b>Road ID</b>	<b>Sediment Reduction from the Road (%)</b>	<b>Sediment Reduction to the Landscape (%)</b>
1-60	38	67

80–99	42	43
200–236	57	63
250–286	39	57
300–325	39	48
370–380	49	17
400–408	47	23
500–536	57	63
600–630	34	46
631–634	45	+54
640–644	79	53
650–678	48	74
<b>Totals</b>	<b>48</b>	<b>51</b>

- ❖ Study findings suggested that installation of rolling dips had a dramatic effect on the rate of road erosion. On an annual basis, road erosion was reduced from 76,005 pounds per year to 41,419 pounds per year. When these results are replicated yearly, the overall benefit could be enormous.

In addition, we expanded Krista’s contract to develop an easy to use protocol for road assessment and modeling for the Navajo Nation. One of the things that Krista discovered in her research was that the crowned and ditched roads maintained by the Nation and the BIA are the roads that are causing the most erosion. But we did not receive an OK to work on them. We want to help the BIA with road design to minimize the erosion, but we were unsuccessful in gaining their interest. We did get cooperation from area residents about closing unneeded roads (see SubTask 2 below). We did not finish the protocol for road assessment, as Krista took a job with the New Mexico Environment Department. (See Krista’s report in Appendix 10.)

### **Subtask 2: Road Work.**

**Status**            **Completed**

**2008.** We held a roads workshop with Steve Carson of Rangeland Hands, Inc. on June 5 and 6, 2008 at Ojo Encino (see photos in Appendix 11). There were 10 participants, including the Chapter’s Vice President. Participants learned about:

- Road drainage concepts found in *Water Harvesting from Low-Standard Roads* (Assessing Needs and Opportunities, Reading the Landscape).
- Drainage management strategies (planning, treatments).
- Use of design tools (clinometer, calibrated pace).
- Survey and Design on the Model Road section – i.e., how to lay out treatments.

*Next Page: [Left] Steve Carson at the Ojo Encino Chapter House giving an introduction to the Roads Workshop. [Right] The participants out in the field learning how to use a clinometer. (Photos courtesy of Craig Conley.)*



Three one-day follow-up sessions with equipment operators were scheduled to review the design and installation of treatments in the Model Road section. The first follow-up session was held June 19. The second was held June 26. The third was held August 7. Support to the road assessment team was provided in reviewing problem road segments and recommended treatments. However, Steve Carson said after the June 26 session: “The crew is doing a very good job on their layout and implementation work. They have made some minor adjustments to their work that I had suggested on my previous trip out. I believe they can handle this project from here on out.”

A Model Road Segment was identified prior to the Roads Workshop and that was where the group learned about survey and design. As a consequence of the workshop and discussions with Steve Carson, it was decided that a larger area, which included the original model road segment, a number of residential and other roads that needed to be remediated or closed, a large headcut, and illegal trash dumping site, would be designated the “model road sub-watershed” and work would be done in that area, to reduce water and sediment flow into Torreon Wash from the model road sub-watershed. It was anticipated that approximately 10 miles of road would be remediated in the model road sub-watershed. In addition, the second session of the Navajo Youth Erosion Control Program (Task 1) worked on the model road sub-watershed. Education and outreach about the need for road closures and re-design produced cooperation from area residents.

Several large rains occurred in the Ojo Encino area in 2008, and the roads held up well and did what they were supposed to be doing, i.e., redirecting the water off the road onto the surrounding land.

Our contractor remediated approximately 16.5 miles of road in 2008. A number of roads were closed. All work and all closed roads were mapped and assessed for erosion savings.

Contractor Steve Carson came out to monitor the work after his June Roads Workshop. He determined that the Navajo contractor, Weston Castillo and his crew, were doing an excellent job. “Weston has done a excellent job on his drainage work. He has mastered the art of project assessment and design as well as the implementations. I am extremely pleased with his work!!”

Based on the instruction from Steve Carson, Weston and his crew developed strategies for the remediation work. These were largely:

- ◇Construction of rolling dips, waterbars, outsloped sections, and other proven treatments that minimize accumulation of runoff on the road surface and spread it onto the surrounding land.
- ◇Realignment, relocation, or rebuilding problem road segments in order to lessen the grade or provide more favorable drainage options.
- ◇Properly closing and reclaiming abandoned roads.



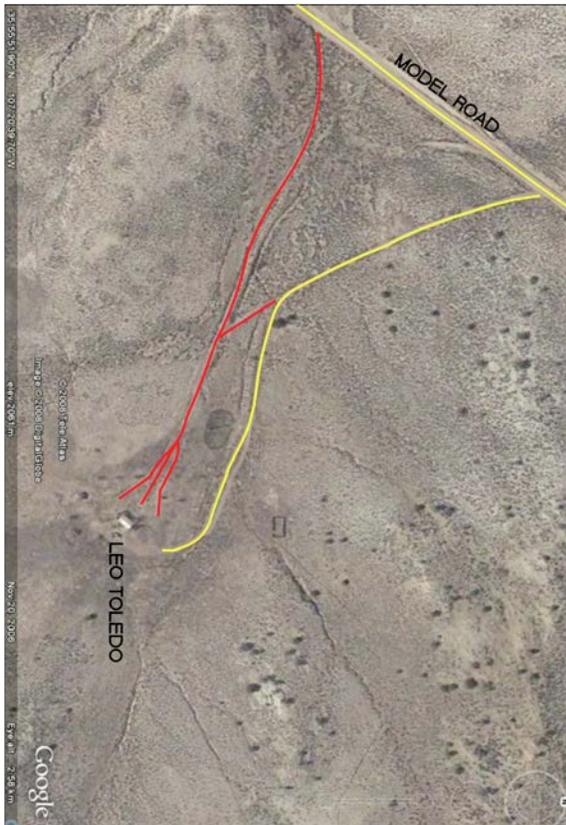
*“Rolling dips” placed in the model road segment, which redirect water off the road and onto the surrounding vegetation. (Photo courtesy of Craig Conley.)*

They worked in the Model Road Sub-watershed that drains into Torreon Wash. Other work, erosion control and headcut, was largely sited to coincide with the road work.

**2009.** Another 13 miles of road were remediated, using 135 structures. Many roads have been closed, so many in fact that one day when the USGS and Quivira were out to put in some gauging, they couldn’t find a route to the site! They had to ask Watson how to get there. Steve Carson was out for a one-day road maintenance training, on May 6, 2009 and worked with the new Ojo Encino Chapter equipment operator. We worked to improve some residential roads and did further work on the Model Road. Seven miles of road were closed this year. We closed abandoned roads leading into the Chapter. It took more soil this year to close the roads, as they were wider. (See maps in Appendix 12.)

**2010.** Weston decided to treat spots this year, and did about 8 miles of road. For example, there were some headcuts in R18 that seem to be coming from old abandoned roads. One area for remediation had been recommended by the Chapter and one by Krista from her assessment. We also did some work in R18, R20, R8, R4, and R2 in combination with erosion control and headcut work. (See pictures of roadwork from 2008-2010 in Appendix 13.)

**2012-2013.** More roads were worked on under the NNEPA 319 Grant during these years (see picture below, from 2012) and more will be worked on next Summer.



Maps showing remediated and closed roads. The red lines indicate closed roads.

**Funding Leveraged.**

Year	Source	Amount	Match
2008	Roads workshop participants	\$1,314	Yes
<b>Total</b>		<b>\$1,314</b>	<b>\$1,314</b>

**Deliverables.** Approximately 38 miles of road were remediated under the TWG and about 25 miles of road closed. Another 18+ miles of road have been remediated under the NNEPA 319 grant.

### **Task 3. Riparian Vegetation:**

#### **Subtask 1: Assessment**

In the workplan, we said that, "We will assess riparian areas with volunteers to identify sites where vegetative conditions are contributing to, or failing to provide protection from, erosion." The bottom line is that vegetative conditions all along Torreon Wash, i.e., lack of riparian vegetation, are contributing to erosion. Planting along any segment will be beneficial. Therefore, we mapped areas where we have planted, either in this project or the RPMC's Watershed Initiative, and we determined the best place to plant cottonwoods and willows each season, depending on where we could get landowner approval. Almost all of the willows planted under the Watershed Initiative died, although many re-sprouted. We did not plant willows the first year because of the mortality rate of the others. But we began planting them in 2009 and have continued.

**Funding Leveraged.** Grant from the Sierra Club, which paid for \$612 of travel while we were determining planting areas.

#### **Subtask 2: Planting**

**Status**            **Completed**

**2008.** This task involved planting riparian vegetation along the Wash to stabilize the banks and protect the area from erosion. Returning native vegetation to the area will also improve water retention and infiltration. In April 2008, the Third, Fourth, Fifth, and Sixth grade classes from Ojo Encino Day School helped plant 300 cottonwoods along Torreon Wash. Approximately 75 students worked over four seven-hour days. In addition, free augering and other earthwork was done by West Construction. Mike Matush from the New Mexico Environment Department helped one day and Craig Conley from the Quivira Coalition lent the group his auger.

The Day School classes were enthusiastic and did enormous amounts of work in a very short period of time. In addition to planting 300 cottonwoods in four days, their teachers asked them to answer questions about erosion and water and to draft a short paper describing what they did at Torreon Wash and what they thought about it. One of the goals of this project is to educate area residents about erosion and water quality. We successfully started that with the school children. Some of their comments included:

"We went on a field trip to plant trees. We planted Fremont cottonwood trees and also we learned about erosion and we saw this big tree that we think is an 80-year-old tree and the roots were sticking out of the sand. I also like planting trees. It was fun and we also know that if you dig a hole water was under ground. . . ." [*Celissia Martinez, 4th grade*]

"We went on a field trip to plant trees. We were planting Fremont cottonwood trees. We all learned words for trees, erosion, roots, arroyo, water. . . it was fun to plant trees." [*Giovanna Padilla, 4th grade*]

“Yesterday we went to go plant some trees in the arroyo. We planted sixty or seventy trees. We talked about erosion.” [*Wilbur Sam, 4th grade*]

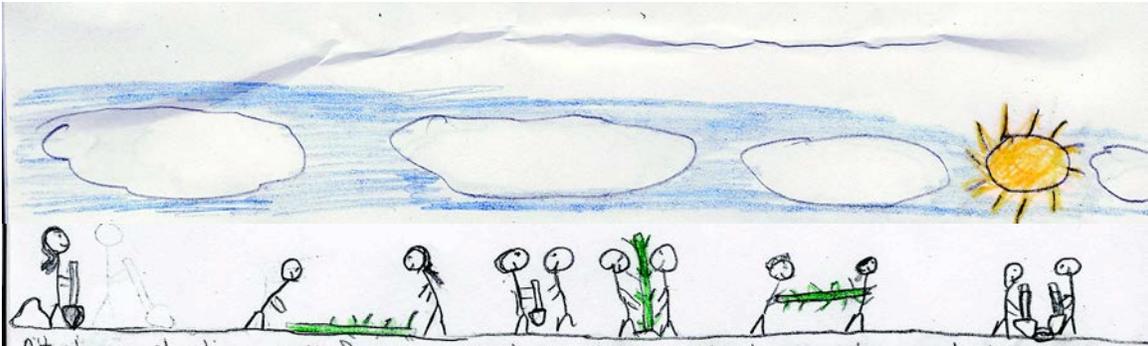
In return trips to the area, there was some concern about rabbits attacking the cottonwoods, so our Task 3 Coordinator painted the trunks and put chicken wire around some. (See pictures from 2008 in Appendix 14.)

**2009.** We needed a longer auger this year to get to the water table, as we were planting further back from the Wash, and the BIA offered theirs, but it did not show up until the second day that the kids were planting, so on the first day they had to use post hole diggers.



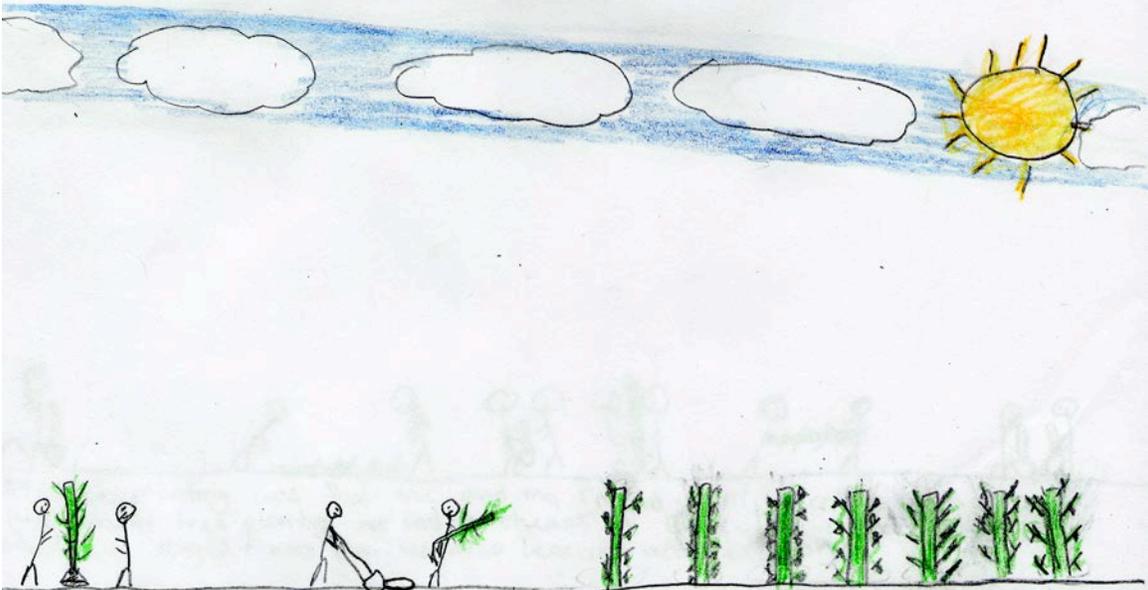
*Kids using post hole diggers to plant cottonwoods. (Photos courtesy of Watson Castillo.)*

Watson and some volunteers went out on April 11, 2009 to cut willows in the Cuba area. Steve Fischer picked up the cottonwood poles from the Los Lunas Plant Materials Center and delivered them to the planting site on April 13. The fourth grade students from Ojo Encino Middle School planted cottonwoods and willows on April 14 and 15. Lula Castillo asked them to make a little booklet of words and pictures about their experience.

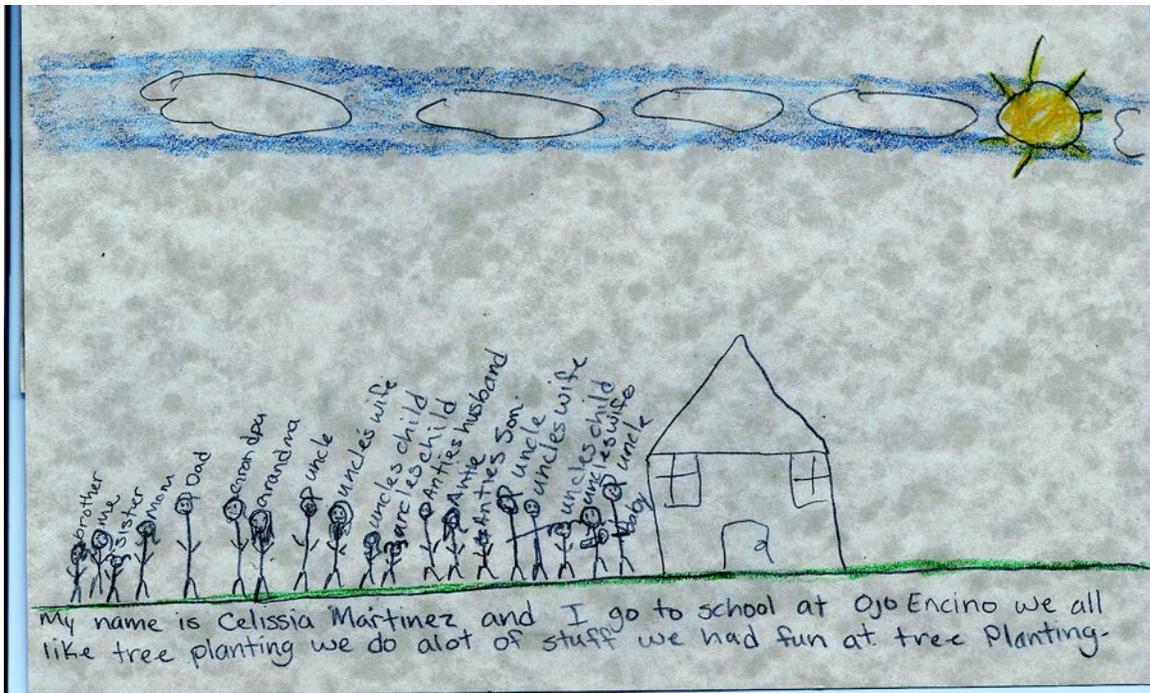


At tree planting was fun me and my friend plant a cotton wood tree we had fun. At tree planting we had to check if there was water in the hole that we dug. It was fun. We also learned about erosion.

At tree planting me and my friends also planted a willow tree we had fun we even had to dig our own holes. It was fun. We also learned about the under ground table.



At tree planting me and my friends also planted a willow tree we had fun we even had to dig our own holes. It was fun. We also learned about the under ground table.



We had a community planting day on April 18, 2009 (see picture below) to plant cottonwoods and willows and some riparian shrubs that the BLM contributed: New Mexico olive, sumac, and four-wing saltbush. We gave the volunteers free containerized shade trees.



We put fences around the plantings, to keep livestock from harming them. We also continued to paint them to discourage the rabbits from nibbling on them. (See pictures and sign-in sheets from the Community Planting Day in Appendix 15, and pictures and sign-in sheets from the kids planting in Appendix 16.)

**2010.** Volunteers cut willows in Cuba on April 9. This year we planted in Penistaja Arroyo with three classes of school children. On April 12, we had nineteen 2<sup>nd</sup> graders, on April 19, we had nineteen 3<sup>rd</sup> graders, and on May 5, we had sixteen 5<sup>th</sup> graders. (See Appendix 17.) We also held two community planting days, one with Ojo Encino on April 10 and one with Torreon on April 17. Sierra Club volunteers showed up for that planting, which was done partly in the rain! (See Appendix 18.)



*Steve Fischer  
and  
Delainey  
Largo  
cutting  
willows for  
the 2010  
planting.  
(Photo  
courtesy of  
Watson  
Castillo.)*

We signed a contract with the State for a small (\$116,000) grant from the State River Ecosystem Restoration Initiative (RERI) to continue planting through 2013. For some reason, the Los Lunas Plant Materials Center had been charging us a lot less than they originally quoted us for the cottonwoods, so we still had about \$5,500 for more cottonwoods next year. We added that to the RERI money.

We visited planting sites from previous years during a Ranchers' Committee meeting (see Task 4) and saw that most of our plantings have been successful. Even trees that appeared to be dead have begun to re-sprout from the bottom. The willows that were planted in 2009 had started to send roots along Torreon Wash and were beginning to sprout new trees. The planting was also beginning to have an effect on the banks of Torreon Wash and was creating a new meander pattern.



*Willows recruiting and forming a bank along Torreon Wash. (Photo courtesy of Steve Hawley.)*

**2011.** We determined planting sites for work under the grant from the State River Ecosystem Restoration Initiative. We got 500 cottonwoods from Santa Ana Nursery, and 200 riparian shrubs (New Mexico Olive, Skunkbush Sumac, and Emory's Baccaris) from the Los Lunas Plant Materials Center. All plants were planted and fencing has been put up to protect them. Our first planting day in 2011 was April 9, a Community Planting Day which included members of the Sierra Club and RPA (see Appendix 19 for Sign-in Sheets), followed by planting with the first and second graders from Ojo Encino Day School on April 11 and 12. We had expected to need more planting days, but the kids were so enthusiastic, they finished planting all 500 cottonwoods, the riparian shrubs, and all the willows we had cut in Cuba on April 10! As always, the teachers asked the children to write and draw something that showed their experience in the field. We also made the Ojo Encino Day School News. (See Appendix 20. There are many more drawings from the kids, but they are in booklets that are not easy to scan. We can supply hard copies.) After 2011, since we were not sending out whole school classes with their teacher, they did not do any further writing and drawing.



**2012.** We planted approximately 500 cottonwoods, 200 riparian shrubs, and many willows with local school children and the community in March and April 2012 under our River Ecosystem Restoration Initiative grant from the State of New Mexico. Our first planting day in 2012 was March 17, a Community Planting Day which included members of the Sierra Club and RPA, followed by planting with students from Ojo Encino Day School during the following week. The plantings kept getting moved because of snow in the area, but were finally completed. Fencing was installed to protect them with money from the BLM. We GPS'd recent plantings in June. (See Appendix 21 for pictures of the planting events.)



*A cottonwood planted by the community and Sierra Club in 2012 along San Isidro Wash. (Photo courtesy of Sandra Deacon.)*

On July 5, there was a major rainstorm and water and sediment flooded Torreon Wash. Most of the plantings (and fencing) that we had done on Torreon Wash were covered in sediment. (See pictures of the aftereffects of the storm in Appendix 22.) Our most recent planting was on a tributary and the plantings that we have done on two tributaries, San Isidro and Penistaja arroyos, were unaffected. We still had money to

plant in 2013 under the RERI grant, but we had to decide where to plant. One thing we needed was a longer auger.

We received more money from the BLM to extend the summer youth project and we had the kids unearth the plants that were covered in sediment, cleanup the ruined fencing, and put new fencing around the surviving plants. Appendix 23 includes two short videos taken of the boys working in these areas to re-fence the trees last year. They discuss why planting the trees is important to the community, and you can see in the background how large some of our older plantings have gotten.

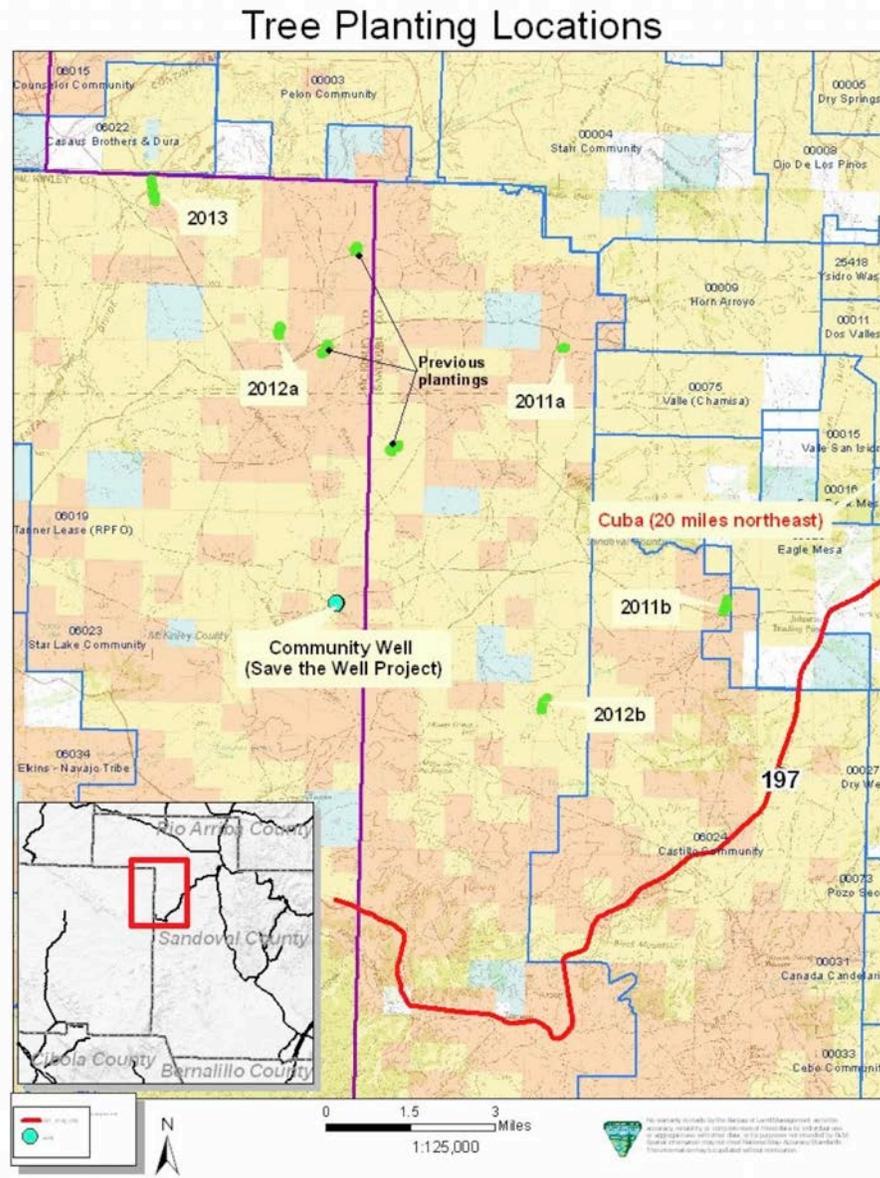


*Storm damage in Torreon Wash. (Photo courtesy of Watson Castillo.)*

**2013.** We planted more cottonwoods, riparian shrubs, and willows with local school children, the Sierra Club, and the community in April under our River Ecosystem Restoration Initiative grant from the State of New Mexico. Fencing was also installed to protect them. Our youngest planter was 4 years old and our oldest was 80! Eleven kids and community members came out on April 5 and the Sierra Club and other kids and community members (about 24) came out on April 6 (see picture below, courtesy of Rachel Gualco.). (See Appendix 24 for 2013 Youth and Community Riparian Planting Photos and Sign-in Sheets.)



The RERI grant was completed in April. We are now looking for more money to continue riparian planting. We mapped all plantings and compiled a map of all TWG and RERI plantings. See Appendix 25.



### Funding Leveraged.

Year	Source	Amount	Match
2008	Students +supplies	\$9,854+\$1,014	Yes
2009	Students	\$4,760	Yes
2009	Community+travel	\$1,971+\$518	Yes
2010	Students	\$7,095	Yes
2010	Community+travel	\$1,502+\$609	Yes
2011	Ojo RERI (supplies, fencing, coordination)	\$14,855	Yes
2011	Students	\$6,307	Yes

2011	Community+travel	\$2,252+\$713	Yes
2011	Supplies—BLM	\$10,000	No/Federal
2011	Salt Cedar Mapping--NN	\$3,600	Yes
2012	Ojo RERI (supplies, fencing, coordination)	\$16,967	Yes
2012	Students/Community+travel	\$2,590+\$276	Yes
2012	Supplies & Equipment—BLM	\$10,000	No/Federal
2013	Ojo RERI (supplies, fencing, coordination)	\$22,592	Yes
2013	Community/Students+travel	\$3,529+\$1,104	Yes
	<b>TOTAL</b>	<b>\$122,159</b>	<b>\$102,159</b>

**Deliverables.** We planted 1,000 cottonwoods, 400 riparian shrubs, and innumerable willows from 2008-2010 under the TWG. We planted another 1,500 cottonwoods, 600 riparian shrubs, and many willows from 2011-2013 under the RERI. We fenced them all. We believe that even with the storm we have an overall survival rate of over 65%.

#### **Task 4. Grazing:**

##### **Subtask 1: Ranch Management Plans**

**Status**            **Ongoing**

We tried to work with the NRCS to develop a grazing plan template that would meet their format so that those plans could be used to obtain EQIP and other funding for implementation. We started in 2008 with seven older plans and five newer ones that had been partially drafted.

We spent a considerable amount of time trying to get some coordination with BIA, BLM, and the NRCS regarding grazing plans but this was definitely a mixed bag. It seemed that every time we talked to someone, we got a different story.

All permittees on an allotment have to sign off on a conservation plan. That was a problem in some cases, as some permits have many permittees. Getting information from the permittees for the plans was very time consuming. Some permittees only speak Navajo and Tammy needed to take a translator, some permittees were difficult to find, some were reluctant to discuss their grazing permit with anyone, etc. And then there were the family feuds, which often made it impossible to get all the needed signatures!

We thought that we were beginning to understand the process, and were trying to develop relationships with BIA and NRCS. The problem then was largely with the Land Boards.

There are four Land Board Districts in Eastern Navajo. Sherwood Willetto of District 20 (the area where we are working) is the President of the Land Board, but the Land Board is not checking on the status of permit requirements. This is a problem all over the reservation: enforcement of permit conditions is lax. BIA leaves enforcement to the Land Board, which operates under the Navajo Nation Department of Agriculture.

Conservation plans need to be signed off on by the Land Board. In 2010 we had a meeting with the Land Board. (Minutes from that meeting are Appendix 26.) They gave us another procedure for grazing plans, which was not the same as the others we

had been given! We continued working with all agencies and, finally, some of the logjam began to break up.

We have six management plans that have been approved by the BIA and the Land Board. The permittees are now working with the NRCS to apply for EQIP money. More management plans are going through the approval process and more are being started. Further information on this Task is in Subtask 2 below.

## **Subtask 2: Range Rider and Grassbank**

### **Status**

<b>Grassbank</b>	<b>Deferred</b>
<b>Horse Reduction Program</b>	<b>Ongoing</b>
<b>Range Rider</b>	<b>Completed</b>

**2008.** The application for a tribal ranch to be the grassbank for the OERC was held up and then finally rejected. The potential ranch we hoped to get went to another applicant. There was another potential ranch that also went to another applicant.

The Ojo Encino Ranchers Committee hired a Range Rider to help ranchers with fencing, cattle movement, and health. That Range Rider was paid under the TWG in 2008.

Work continued with the Ojo Encino Ranchers Committee on their individual grazing management plans. We attended the quarterly meetings of the OERC each year for the last six years. (See Agendas, photos, and sign-in sheets, Appendix 27.) The grazing management plans were frequent agenda items. At the Ojo Encino Ranchers Committee Meeting on June 8, 2010 we took a field trip to the various work sites. We met with the kids at the erosion control site on R18, visited the trash cleanups at R5 and R4, saw more roads that Weston had closed, and visited the planting sites from 2010 as well as from past years.

**2009.** We suspended the contract of the 2008 range rider while we re-thought the job. Originally, the range rider was envisioned to manage the cattle on the grassbank. When we were unable to obtain a ranch for the grassbank, we had the range rider helping grazing permittees with fencing, etc. We decided that the range rider should instead be helping permittees implement their grazing management plans (Subtask 1). We had no funds to pay for fencing, water development, etc. That money was to come from EQIP or other sources available only to the individual permittee. So, we needed to help the permittees with grazing management plans to obtain funding so that those plans can be implemented. At that point, we could resume the range rider task and the range rider could help with implementation, especially for our many elderly permittees.

We hired Tammy Herrera to work as the Range Rider, helping permittees to develop grazing plans that would address all livestock, including horses. We developed a template for the plans that we thought would meet NRCS requirements but those requirements turned out to be a moving target (see Subtask 1).

The Quivira Coalition held a Grazing Workshop at Ojo Encino on May 8 and June 23, 2009. There were eight participants. (See photos, etc. in Appendix 28.) The Agenda was:

◇Orientation

◇Introduction to Goal Setting and Planning for a Purpose

◇The 6 steps to implementing the Ojo Encino Ranchers' Committee 5-year Ranch Unit Management Plan

◇Ecosystem functioning, including characteristics of water and mineral cycles, and how grazing planning can enhance these functions

◇Ranch Management Plan forms

◇Field Trip to watershed improvement sites.

We began to realize that the biggest problem for the land has been the overabundance of unmanaged horses. When Kirk Gadzia was out for the Grazing Workshop, he said that the horses were eating 50% of the available forage, leaving not enough for sheep and cattle.

Therefore, in 2009, Tammy began an assessment of the number of horses on the range. Tammy gathered and counted the horses at Ojo Encino. (Photos from this inventory are in Appendix 29.) In a 12-mile by 24-mile area, there were 700+ horses, in addition to sheep and cows, etc. She divided the area into three sections and counted the horses per section, taking pictures to document the condition of some of the horses. It appeared that 10% of the horses were being managed and fenced, as they were used regularly. An additional 10% were rideable, and the remainder were not rideable. Many horses were not branded and appeared not to have been touched by humans in years.



*Horses running freely on the range, photographed during the horse inventory. (Photo courtesy of Tammy Herrera.)*

She attended a week-long grazing workshop given by Kirk Gadzia and did research on experimental horse birth control that we wanted to institute as a pilot program.

Three new grazing plans were competed and three old ones were updated, based on knowledge Tammy gained from taking Kirk Gadzia's range management class. The feedback that Tammy got from the permittees seems to indicate that they are positive about looking at range management differently.

As Range Rider, Tammy performed first aid on some cows, repaired fences to keep some horses out of the rights-of-way, and assisted ranchers with chores such as hay and water for their livestock. We hired an assistant Range Rider to help Tammy with some of this as she then started working on the horse fertility demonstration project and the summer 4-H program (see Task 6).

Tammy went to Montana in May to get trained in the use of the PZP vaccine, which stops fertility in mares for almost two years. One-year-old mares are ideal for this treatment. They get one shot of the vaccine, then another in six months. Each dose costs \$21. (This cost of the demonstration project was paid for by the Quivira Coalition's grant from the Christensen Foundation.) It is necessary to round up the horses in a pen and then shoot them with the vaccine gun.

Tammy is now certified to use the PZP vaccine. Tammy vaccinated 25 horses with PZP in 2009. More people are still coming to her for the vaccine. We rounded up some horses with the range rider, vaccinated them or gelded them and then turned them back out onto the land.

The Ojo Encino Ranchers Committee discussed a resolution on horse management for the Chapter. They wanted horses to be treated like livestock and therefore included in any grazing management plan—the BIA, however, said we could not do that. The Chapter passed the resolution in early April (see Appendix 30). That resolution needs to be extended.

We still need more cross fencing installed to keep the horses out of grazing land. NNEPA has been working on that with some of our summer crew for the last few years (2012-1013).

We also began more education with the residents. We needed to make it simple: they need healthy land to have animals, any animals, even horses. Tammy conducted a Horse Expo at Ojo Encino on October 17. It was a little windy, but otherwise a nice day. About 40 people showed up from Ojo Encino, Torreon, and Waterflow to learn about horse health and care. Steve Lucero from Sandoval County 4-H was there to talk about 4-H. A veterinarian, Dr. Quintana, and his assistant Brandi from Animal Haven Clinic in Farmington, came and looked at a number of horses and showed the attendees how to assess their horse's health. There was also a farrier and a horse management demonstration. The wind prevented Tammy from setting up her PZP display, but the attendees still were able to discuss horse contraception and sterilization. (See photos below and in Appendix 31.)



*Photos from the 2009 Horse Expo. (Photos courtesy of Avery Anderson.)*

**2010.** Tammy held a free PZP and Gelding Weekend April 24 and 25, 2010 (see photos in Appendix 32). The PZP was supplied by the Quivira Coalition under their

Christensen grant; we paid Tracy to do gelding. There was a lot of interest and a number of people brought horses to be treated.

**2011.** Tammy held another free PZP and Gelding Weekend March 19-20, 2011. There were about 40 participants and more horses were treated with PZP.

**2012-2013.** The Quivira Coalition and Hasbídító received more money from the Christensen Foundation to work on the feral horse issue. They are working on a plan to deal with horses in the tri-Chapter area of Ojo Encino, Torreon, and Counselor. The Navajo Nation has been contemplating a horse round-up in the area, but that has not yet been scheduled. Tammy did a new horse inventory and it appears that the number of horse at Ojo Encino has gone down in the last three years, although we are not certain why. We have been using PZP and gelding horses, as well as encouraging voluntary reductions.

**Funding leveraged.**

<b>Year</b>	<b>Source</b>	<b>Amount</b>	<b>Match</b>
2008	OERC Mtgs+travel	\$1,584+\$506	Yes
2008	Grazing Workshop attendees+travel	\$2,703+\$368	Yes
2009	OERC Mtgs+travel	\$7,572+\$2,323	Yes
2009	Travel—Sierra Club Grant	\$761	Yes
2009	Tammy (Gadzia Workshop—QC)	\$901	Yes
2009	Gadzia Grazing Workshop Fee (QC)	\$2,670	Yes
2010	OERC Mtgs+travel	\$6,696+\$2,330	Yes
2010	Travel—Sierra Club Grant	\$1,873	Yes
2010	Permittees, Grazing Plans+travel	\$1,295+\$41	Yes
2010	Watson, Grazing Plans	\$150	Yes
2010	SRM meeting--presentation	\$648	Yes
2010	Land Bd Mtg	\$845+\$207	Yes
2011	OERC Mtgs+travel	\$4,920+\$1,794	Yes
2012	OERC Mtgs+travel	\$3,720+\$1,541	Yes
2013	OERC Mtgs+travel	\$3,552+\$1,265	Yes
	<b>TOTAL</b>	<b>\$50,265</b>	<b>\$50,265</b>

**Deliverables.** We were unable to secure a tribal ranch for a grassbank. Instead we worked with the Chapter and OERC to reduce unmanaged horses on the range. We introduced PZP and gelding as methods, and worked to educate the residents about the damage the horses were doing to the land. We had difficulty with the BIA and Land Board, but we have finally had six grazing plans approved and at least six more are in the process of being developed or approved.

**Task 5. Trash:**

**Subtask 1: Cleanup**

**Status**            **Completed**

**2008.** The illegal trash dumps in the Ojo Encino area were mapped. The ones that were near the model road sub-watershed were targeted for cleanup first.



*R10, before and after cleanup. (Photos courtesy of Watson Castillo.)*



**2009.** We contracted with Weston Castillo of West Construction to clean out two large illegal dumping sites in the R11 and R10 areas in 2009. They separated cars and appliances, etc. which were hauled away by the Chapter. While doing the cleanups, they also closed roads to the sites to make it more difficult for them to be used again. The Northwest New Mexico Regional Solid Waste Authority (NWNMRSWA) provided bins and hauled away tons of trash. (See photos in Appendix 33.)

The Sierra Club held a volunteer weekend September 26-27, 2009 at Ojo. Twelve volunteers helped clean up a medium-sized dump site in R5. Rochelle came up from NMSU to help clean up the site and to discuss erosion control with the group on

Saturday and then helped them do rock erosion control and headcut work on a different area on Sunday. The group camped out near the sites and had dinner Saturday night with Roger Toledo, Chapter President, and some other residents. The Sierra Club donated a projector to the Chapter. (See photos, etc. in Appendix 34.)



*[Top] Sierra Club helping to clean up R5 illegal dumping site. [Bottom] R5 site after cleanup. Photos courtesy of Watson Castillo.)*



**2010.** Weston and his crew finished cleaning up the R5 site in 2010 and also cleaned up a large site in R4 that the Chapter was concerned about. He also closed roads leading to the sites. (See photos in Appendix 35.)

**2012.** We received money from the BLM and New Mexico Association of Counties to help clean up solid waste illegal dumping sites that were identified on Bureau of Land Management (BLM), Rio Puerco Field Office (RPFO) administered lands in

Sandoval County, New Mexico. The BLM in cooperation with the Rio Puerco Alliance (RPA) identified high priority sites. Project priorities included three tasks:

1. First, one large trash site was cleaned using heavy machinery. Sites were selected due to their proximity to roadways and overall impact.
2. Second, two dumpsters were provided and funded at the Chapter Houses of Torreon and Ojo Encino – with request for Match from the Chapters, dumpsters will be funded for two years.
3. Third, two youth hand crews were hired from Torreon and Ojo Encino to clean up small sites. Youth were targeted specifically to encounter the trash issues of the current generation in a hope that long-term behavioral change can begin. Crews consisted of 4-5 youth and young adults and 1 Supervisor. These crews cleaned up 12 small sites. (See Report in Appendix 36.)

**Funding Leveraged.** See Subtask 2.

**Deliverables.** We cleaned up three large sites and a medium-sized site with TWG funding. We cleaned up one large site and 12 smaller ones with BLM funding.

## **Subtask 2: Education**

**Status**                      **Ongoing**

Maureen Murphy of the USDA, Watson Castillo of Ojo Encino, and Ojo Chapter President Roger Toledo had a number of meetings with a group from Torreon and Counselor about letting a contract for a six-month feasibility study regarding a tri-chapter transfer station. They wanted to let the contract to a company from Canada, NextGen, but everything got held up at the Navajo Nation. NextGen has been a pioneer in trash alternatives for sparsely populated rural areas, such as mobile trash collectors, with compactor included, or not having a transfer station at all, opting for an all-portable system. Due to the delay caused by the Navajo Nation, the money for the six-month feasibility study regarding the transfer station was taken back by the State Department of Indian Affairs. This part of the project was therefore not able to go forward as planned. Instead, we helped fund trash bins to begin moving residents from illegal dumping to legal disposal of trash. Various methods for trash disposal have been explored but the rural nature of the area and the sparse population have been hindrances to the traditional ways of dealing with the problem.

**2009.** The Ojo Encino Chapter sponsored a small trash cleanup day on Earth Day, April 22, 2009. In the meantime, we started working with Ojo Encino Chapter to get some trash bins for Ojo. They wanted to do a one-year pilot project. They wanted to site a large trash bin at the Chapter for residents to use and to try to begin a recycling program. They wanted to do more education with the community and consider other options to reducing trash such as composting. We helped Hub RC&D write a grant to get some (approximately half) of the needed money. RPA paid for the other half of a trash bin (\$800/month) for a year. The Chapter contributed a part-time employee to man the trash bin, which is open during the same hours the Chapter House is open. They sited the 40-yard trash bin near the Chapter House for residents to use, and they are using it for free.

RPA, Hub RC&D, and the Ojo Encino Ranchers' Committee (OERC) met with personnel from Navajo Solid Waste to learn about Solid Waste regulations and how a regional transfer station could be started for the five Chapter (Ojo Encino, Torreon, Starlake, Whitehorse Lake, and Pueblo Pintado) area. Surveys were conducted to learn about the solid waste needs and attitudes of area residents. We attended seminars on Solid Waste in Farmington (April 10 and 11) and took field trips to San Juan County Transfer Stations. The Ojo Encino & Torreon Chapters and Hub RC&D were given Environmental Excellence Awards from Navajo Nation EPA on April 16 for their work on solid waste issues. The Awards were presented in a ceremony associated with the Navajo 5th Annual Environmental Conference in Window Rock.

A recycling seminar was held at Pueblo Pintado in September. Pueblo Pintado and Whitehorse Lake have existing trash facilities (not a transfer station).

**2010.** The 40-yard trash bin that is near the Chapter House was being filled and removed approximately every three weeks. We discussed with the Chapter the option for them taking over the program and continuing it for another year.

The RPMC made a trip to Washington DC in June 2010 to meet with our congressional delegation. While we were there, we met with the National Association of RC&D Councils (NARCDC). They were thrilled to hear what we had been doing and kept us for an hour talking about the programs at Ojo (Watson, Tammy, and Mike Benson from the RPA Board were there with us). They suggested that there might be other programs they have that can support more trash work. We therefore wrote another Diversity Grant with Hub and received another \$5,000 from NARCDC for our work.

**2011.** The Chapter paid for a part-time employee to manage the bin and the OERC began surveying the people using the bin to determine whether the residents were willing to pay a small fee for continued use of the bin. Based on conversations at OERC meetings, it is clear that the community wants the bin to stay, but it is not clear that they are willing to contribute to it. The Chapter included some money in their budget to pay for part of the cost of the bin through the end of this year. We looked for other funding options as well.

**2012.** The 40-yard trash bin that is near the Chapter House was being filled and removed approximately every three-four weeks. The Chapter started charging for use of the bin in May and use dropped off. The BLM, which funded a cleanup in the area on BLM land (see Subtask 1), allocated some of that money to keep the bin in use for at least another 18 months, free to the residents. We also installed a free trash bin at Torreon Chapter under the BLM project.

**2013.** The BLM money is keeping the bin in use for at least another six months, free to the residents. We also have a free trash bin at Torreon Chapter under the BLM project. (See pictures of the trash bins in Appendix 37.)

**Funding Leveraged.**

<b>Year</b>	<b>Source</b>	<b>Amount</b>	<b>Match</b>
2009	Community Cleanup Day+travel	\$1,126+\$345	Yes
2009	Sierra Club Cleanup Day+travel	\$2,816+\$2,070	Yes

2009	Watson travel (in-kind)	\$230	Yes
2009	Watson travel—Sierra Club grant	\$460	Yes
2010	Watson + travel (in-kind)	\$375+\$46	Yes
2010	Trash Bin—Sierra Club grant	\$689	Yes
2010	Watson travel—Sierra Club grant	\$678	Yes
2010	Trash Bin—HUB grant	\$5,000	Yes
2011	Trash Bin—HUB grant	\$5,000	Yes
2011	Trash Bin—Ojo Encino Chapter	\$4,070	Yes
2012	BLM/NMAC Cleanup and trash bins	\$50,000	No
2013	Trash Bin—BLM/NMAC	\$10,000	No
	<b>TOTAL</b>	<b>\$82,905</b>	<b>\$22,905</b>

**Deliverables.** We have kept a free trash bin at Ojo Encino for over three years. We have kept a free trash bin for over a year at Torreon. It is clear from our conversations with the Chapters that they want to find a way to have a convenience center or transfer station for the five-chapter area (Ojo Encino, Torreon, Counselor, Pueblo Pintado, Whitehorse Lake). We are continuing to try to figure out how to do that. We have also worked with Baca and Littlewater Chapters to get them free trash bins for a year or so, and we are in talks with Counselor.

**Task 6. Education and Outreach:**

**Subtask 1: Community Outreach**

**Status**            **Completed**

*Outreach*

**2008.** Outreach began with the Rincon Marques area ranchers. They were contacted about erosion control work in their area and how that could help improve their land. They told us about their concerns and we discussed developing grazing management plans with them. A representative from the Quivira Coalition, which had taken on some of the outreach work, traveled to the project area about once a week in 2008 to check on progress on all tasks.

**2009.** The Ojo Encino Ranchers Committee sponsored a Native Food Day on April 10 (see sign-in sheet in Appendix 27). Representatives from Counselor were there to talk about gardening, greenhouses, planting, and soil testing.

We started doing outreach with the Hasbídító group at Counselor, which is trying to become a 501c3. Hasbídító seeks to increase the sustainable and culturally compatible economic opportunities within the community by offering educational and community development services. By bringing youth-centered strategies to create culturally, environmentally, and economically sustainable solutions to the Hasbídító area and beyond, the group hopes to bring opportunities for youth to succeed and bring their experiences back to the community. The group seeks to accomplish this by offering youth opportunities, dry farming support, implementing both computing and sustainable technologies, technology education, and encouraging entrepreneurship. Hasbídító is a community derived, managed, and guided organization started in the summer of 2009.

The Quivira Coalition received money from the Packard Foundation for a one-year pilot study of old cornfields in the tri-chapter area (Torreon, Counselor, Ojo Encino). These areas seem to hold water longer than other areas. They wanted to try to restore them with one-rock dams, and by fixing the road drainage, and turn them back into production. They inventoried sites, did some restoration, and continue to monitor them, assessing soil moisture in particular.

Tammy and Tracy also researched the mobile matanza and commercial kitchen that is now functioning in Taos. This allows ranchers to process livestock on site. We discussed the feasibility of doing something like that in the Ojo area.

**2010.** We continued outreach with the Hasbídító group. The group received the first installment of a grant from First Nations for training and achieving 501c3 status. RPA is their fiscal agent. Our Outreach Coordinator helped them with their strategic plan and community outreach program.

We helped them begin to set up their financial system and, through a First Nations training in August, they learned more about the requirements of a non-profit. The Board learned more about its responsibilities. Their various task leaders have had a lot of training in a variety of things that could be useful to Hasbídító in terms of community building, dryland farming, and various entrepreneurship opportunities. We are helping them expand their visibility to other organizations to bring in new partners and possibly new funding. We helped them work with the school to start a school garden program, with assistance from Hunger Grow Away, another New Mexico non-profit.

The Navajo Nation made a formal request to keep the old school building and we fundraised to help start a community kitchen using that old building. The Cuba Farmers Market would like to partner with Hasbídító and RPA on that.

*Watershed Forum.* Tyffany Herrera and Rochelle Vandever, who have been coordinators for our Task 1 erosion control projects, made a presentation to about 200 people at the 2010 New Mexico Watershed Forum about *Promoting Land Health on the Navajo Nation at the Ojo Encino Chapter*. Their presentation showed the how the Ojo Encino community has made significant improvements in the health of their watersheds by using low-tech erosion control techniques, road closure and maintenance, riparian planting, grazing management plans, and the feral horse management program. Rochelle graduated in June from NMSU in their Engineering program. Their presentation was very well received.

**2011.** We continued outreach with Hasbídító. The group received three more installments of the grant from First Nations for training and achieving 501c3 status.

Under the First Nations grant, which ended April 29, Hasbídító learned about the requirements of a non-profit and about the Board's responsibilities. They received some bookkeeping training from First Nations and set up their Quick Books accounting system, opened a bank account, purchased a computer and software, and obtained fax and internet capability.

The McCune Charitable Foundation gave Hasbídító \$1,500 to start a feasibility study on using the old school building as a community kitchen and economic hub, and we received \$25,000 from the USDA NIFA Community Food Program in September to learn more about food access in the Tri-chapter area. We met with a group of community

members and the BIA about plans for use of the old school. We met with Ojo's Council Delegate and the Navajo Nation Vice President in August to move this process along.

While we were waiting to hear about the old school building, we secured another grant from First Nations to upgrade the kitchen at the Ojo Encino Chapter House.

The University of New Mexico Prevention Research Center offered Hasbídító a grant to put together a field trip exploring areas of community-based farming and how that translates to healthier living and better access to fresh, affordable foods. RPA's VISTA, Nik Gualco, contacted the North Leupp Family Farm (NLFF) as well as a few other partners and put together a trip on December 28th and 29th, 2011. Seven of us carpooled 350+ miles to Arizona to visit the folks in Leupp. (See photos, Appendix 38.) The NLFF is a Diné community-owned and operated farm located near the Little Colorado River in the community of Leupp, in the southwestern portion of the Navajo Nation. The farm operates under the guidance of the NLFF Board of Directors. The organizational goal of NLFF is to become a chartered non-profit entity that is sustainable and culturally relevant. The purpose of the NLFF is to promote the creation of food-secure communities and the development of sustainable agriculture as well as providing for, and supporting a healthy lifestyle; encouraging environmentally sensitive agricultural practices; and advocating for the revitalization of Diné agricultural traditions.



*Inside the greenhouse at Leupp. (Photo courtesy of Nik Gualco.)*

Dryland farming has been the traditional way of agriculture for the Navajo people for generations. Within the past 50 to 70 years, there has been a large exodus away from Navajo lands to the larger cities. At the same time, those who have stayed have moved away from farming and more traditional uses of the land. And on top of that, many of these lands now face severe environmental degradation from accelerated rates of erosion and loss of topsoil. Hasbídító has been working to bring back many traditional ways as a means of achieving economic sustainability within their communities. Our partnership exists because of a common understanding for the need for proper land use and the

benefits of remediating soil erosion. Many of these same ideas have been gaining momentum all across rural parts of this country, but the connection to traditional Navajo practices can only be found in a few places. One of these places is Leupp, Arizona, where North Leupp Family Farm works to "re-engage the local communities in time-honored farming practices and culinary tradition, while working to establish healthy communities through healthy eating and dynamic lifestyles." Their emphasis on preserving traditional Navajo culture and history while working towards sustainability and independence for their community closely aligns with Hasbídító's mission.

**2012.** We continued outreach with Hasbídító.

The Navajo Nation made a formal request to keep the now-vacant old school building, and we tried to fundraise to help start a community kitchen and economic hub using that old building. We met with Ojo's Council Delegate and the Navajo Nation Vice President in August 2011 to move this process along. Another meeting was held in February 2012, but further information is needed from the BIA before the Nation can get this building. (See rendering of the proposed use of the old school building in Appendix 39.)

**2013.** We continued outreach with Hasbídító.

We completed the analysis of the information we gathered under the USDA NIFA Community Food Program grant and the Honor the Earth energy grant. Our report is Appendix 40. We learned that 25% of the people in the Tri-Chapter area don't have electricity. Many more still do not have running water. There is increased interest in re-establishing local food production and distribution, and we have begun working with Hasbídító to achieve that. We received funding from Walmart and the New Mexico Department of Agriculture to start a Mobile Farmer's Market in the Tri-chapter area. (See rendering of the Mobile Farmers Market in Appendix 41.)

In addition, we finished the upgrade the kitchen at the Ojo Encino Chapter House.

It appears that Ojo Encino will get part of the old school. The other part will be torn down. Negotiations with the BIA are still underway.

#### *Website*

We worked on developing the RPA website. Our VISTA Summer Intern completed the first iteration of the website in 2010. It is [www.riopuercoalliance.org](http://www.riopuercoalliance.org). We are currently working to update it again and to include the RPMC website with it. We also now have a Facebook account.

#### *RPA/RPMC Outreach Coordinator*

**2010.** We developed a job description for the RPMC/RPA Outreach Coordinator in conjunction with the RPMC. RPA received money from the BLM to fund RPMC's portion of the Coordinator's salary. We placed an ad in the *Albuquerque Journal* and hired a Coordinator. The Outreach Coordinator:

- Develops and implements an outreach strategy for the Rio Puerco Management Committee (RPMC). Works with tribal and local governments, NGOs, schools, local residents, and land users to seek participation in implementing projects. Encourages the use of best management practices through training, workshops,

- demonstrations, publications, and personal contact. Schedules and coordinates presentations using the RPMC's Land Health Kiosk.
- Organizes and manages activities and programs supporting the implementation of outreach activities for the Targeted Watershed Grant (TWG), under the direction of the RPA's Executive Director and the TWG Steering Committee.
  - Helps Hasbídító group set up its non-profit and trains Navajo Coordinator, under the direction of RPA's Executive Director.
  - Completes additional assignments from the Rio Puerco Management Committee or its Executive Committee, typically related to organizational development and fundraising, under the direction of the RPA's Executive Director.
  - Attends RPMC meetings and workdays.

**2011.** The RPMC held a meeting organized by Senator Bingaman to revitalize the group and plan strategies for its next decade. A large part of those activities will be centered around the outreach plan developed by our Outreach Coordinator and presented to the RPMC on October 20.

Our Outreach Coordinator also helped Hasbídító in setting up its non-profit. In addition, she attended the Ranchers Committee Meetings, and completed an application for a full-time VISTA volunteer.

We ran out of money to continue this position in 2011 and were forced to let the Outreach Coordinator go. We found more money in 2012, and hired our 2011 OSM/VISTA as the Outreach Coordinator.

**2012-2013.** We hired Nik in December 2012. He worked to expand the BLM trash project and he supervised the 2012 VISTA, helping her with the Cuba River Clean-up and other RPA projects. He developed another Outreach Plan, which included expanding our efforts into the Rio San Jose.

#### *OSM/VISTA*

**2011.** We got a three-year commitment from Americorps for a full-time OSM/VISTA from the Western Hardrock Watershed Team. Our first volunteer, Nik Gualco, started September 6, 2011. The OSM/VISTA spearheaded outreach activities in the Cuba area and continued working with Hasbídító. The work in Cuba included the establishment of an annual Cuba River Clean-up. The first Clean-up was held in 2012.

Through a partnership with the Cuba Farmer's Market—a branch of the Nacimiento Community Center—Nik began talking with a few growers about the ideas of food distribution and economic development. One model that we were excited about is that of a Portable Farmers Market bus. There are several of these that exist throughout the country and Nik contacted one about start-up advice. The idea would be to provide local growers with an opportunity to produce more while being able to physically transport the food to the tri-chapter area. Ideally, once the bus arrives in Navajo land, it would also pick up more local grown produce, and continue towards a set market place.

**2012.** The work in Cuba includes an annual Cuba River Clean-up, the first of which occurred June 30, 2012. Nik also spearheaded the trash cleanup project on BLM land, which included youth crews at both Ojo Encino and Torreón (see Task 5). Emily

Wolf joined us in August 2012 as our second year OSM/VISTA. We hired Nik as Outreach Coordinator in December.

**2013.** Emily continued extensive outreach activities in the Cuba area and our work with Hasbídító (see above). The work in Cuba included the annual Cuba River Clean-up, the second of which occurred June 29, 2013. (See photos and story about the two River Cleanups in Appendix 42.) In addition, Emily arranged for a two-week tour from the National Civilian Conservation Corps (NCCC) in Cuba, working with Step Into Cuba. They are a hand-crew developing a hauling path into a walking path for use in a new regional trails system. Work duties included the removal of ½ mile of dilapidated fencing, construction of numerous erosion-control structures on the path to alleviate loss of topsoil, removal of two invasive species, trimming of shrubs, and the planting of willows. Phase II also included the construction of several water harvesting structures in the streambank of San Jose Creek aimed at reducing erosion, building sediment and vegetation, stabilizing streambanks, and the eventual raising of the water table. They were there from April 15-28. The residents of Cuba were very pleased with the crew and their work. They even held a potluck for them. We made another application for the NCCC team to come out in 2014. They will be there in March. (See photos of the NCCC team's work in Appendix 43.)

Our third-year OSM/VISTA, Sarah Meade, joined us in August 2013. She continues to work with Hasbídító on the Mobile Farmers Market. We are applying for another three-year OSM/VISTA, for Hasbídító.





*[Previous page]  
Nik, Emily and  
Sarah, RPA's  
three  
OSM/VISTAs.  
[Left] The  
NCCC Team at  
the bench they  
hauled up a hill  
and set up!  
(Photo courtesy of  
Emily Wolf.)*

**Subtask 2: Horse Program**  
**Status** **Completed**

**2008.** A preliminary horse program was instituted July 7, with help from 4-H. Twelve kids of varying ages were identified as interested in the program for this summer.

A round pen and portable horse pens were set up on an area ranch. Supplies, such as saddles, helmets, and tack, were ordered. An outhouse was built at the site. It was expected that the children would learn how to care for the horses (feeding and watering them, as well as grooming them), how to saddle them, and begin to learn how to ride them. (See photos, Appendix 44.)

We worked to set up a 4-H program at Ojo Encino to help educate the children (and their parents) about the horse problem in the area. Many horses run free and graze forage that is needed for cattle and sheep. They are also making the erosion problem worse. We hoped to use the program to get some horses off the range and train them enough to be able to sell them. It was anticipated that an official 4-H program would be in place in 2009, with help from parents. In 2008, the parents were supplying food and other items for the children involved in the preliminary program.



This year, a dozen children learned about horses, horse safety, horse grooming and feeding, and eventually horse riding. Among the activities that the students engaged in (in addition to overnight stays with Tammy Herrera at the Horse Camp site at the Mace Ranch [site in photo above]):

- students set up a 4-H compatible “Trail Ride Course” and practiced on it (eventually they were timed on the Course);
- watered, fed, washed, and groomed the horses every day they were at the Camp;
- took several two to three mile trail rides;
- learned about handling wild horses at a demonstration on “Learning to Train a Green (Wild) Horse,” given for free by a visiting horse ferrier;

- studied and learned the Parts of the Horse (from the 4-H curriculum on Horses and Horsemanship
- studied and learned the Parts of the Saddle; and
- completed a longer Trail Ride on the last day of Camp.

Tammy Herrera, who supervised the work with the students, awarded prizes to the students who attended all days of the Horse Camp this summer.

In addition, she talked with parents and students about continuing the work to set up an official 4-H program throughout the winter and spring. This included monthly meetings throughout the winter.

We appreciate the help we got on this program from Steve Lucero of the Sandoval County Extension Office who provided work books, curricula, and the Livestock Emergency Kit.

During the winter of 2008-2009, we continued to run the Program, which included:

- ❖ Registering all interested students and leaders after talking to them about the 4-H program.
- ❖ Running a monthly meeting according to the procedures and requirements of 4-H.
- ❖ Discussing and planning activities and events within the Sandoval County and Ojo Encino Sage Riders Club.
- ❖ Planning and coordinating activities with students for the Summer of 2009 (Horse School).
- ❖ Coordinating activities relating to the 4-H Horse Program and following through with events.
- ❖ Documenting activities through pictures. (Tammy received a camera [from TWG] and a computer [from Quivira].)
- ❖ Coordinating and assisting mentors who are presenting and teaching activities.
- ❖ Purchasing supplies, needed for program and activities, keep Inventory and update when needed.
- ❖ Reporting progress to Ojo Encino Ranchers Committee, RPA and Quivira as needed.

**2009.** We had an official 4-H program at Ojo Encino, the Ojo Encino Sage Riders. Officers were chosen. Five students with horses attended the 4-H Horse School June 2-7 in Albuquerque. (See photos of the Horse School in Appendix 45.) The students saddled up, set a course, and were evaluated. Then they were put into groups for education: beginning, intermediate, and advanced. Several of our kids placed in their groups. These five students then helped Tammy with the summer 4-H camp at Ojo as mentors for the other students. The kids started working with some green horses, hoping to get some of the horses trained to the point that they can be used at State Fair 4-H activities and then sold at the silent auction.

There were other training programs during the summer as well:

- A horse trainer from Missouri came out again for two days, bringing all of his own equipment, to give the students a demonstration on how to handle a green horse and how to trim hooves.
- There were farrier demonstrations and a class on horse health and nutrition.
- The students learned about horses and how to care for them.

- The students attended horse shows and gymkhanas (horse competitions) at the Cuba Fair Grounds.
- Tammy provided education on the PZP vaccine for the students and their parents (see Task 4).

The grant that Quivira got enabled us to have Tammy continue with this for the winter. TWG money will fund the summer program. One mentor who worked with 14 children during the holidays was a local, Yazzie Lopez, who is an expert in leather tooling. (See photos of the kids' leather crafting below and in Appendix 46.)



We did 8 weeks over the winter, which is 8 sessions. In addition, we worked with Quivira under their Christiensen grant to do outreach and under their Packard grant to study agricultural fields.

Twelve students continued in the 4-H program. All of them participated in the 4-H Parade on August 1 and six participated in the Horse Show on August 2.

**2010.** The 4-H program continued to have between 12-15 students at all times.

**2011.** The official 4-H program was suspended while we tried, and failed, to find funding to continue it.

### **Subtask 3: Newsletter**

**Status**      **Completed**

We developed and printed seven newsletters. We are working on an eighth, but we need money to print it. All newsletters are in Appendix 47.

### **Subtask 4: Other Publications**

**Status**      **Completed**

We had trouble getting the erosion control manual drafts that we originally had planned to print. In the meantime, Tammy found out that the Rock Point Community School in Chinle, Arizona, still had some of the *Living From Livestock* books that we had thought we needed to reprint. So we purchased 150 of them to distribute the area ranchers instead. Tammy is still handing them out to interested ranchers who are developing their management plans.

**Funding Leveraged.**

<b>Year</b>	<b>Source</b>	<b>Amount</b>	<b>Match</b>
2008	Horse facilities	\$1,500	Yes
2008	Horses (12 x \$50/day x 12 days)	\$7,200	Yes
2008	Books, videos donated by 4-H San Isidro	\$300	Yes
2008	117 hrs x 8 students @\$12/hr (4-H)	\$11,232	Yes
2009	20 hrs x 12 students x \$12/hr (winter program)	\$2,880	Yes
2009	24 hrs x 9 students x \$12/hr (June 4-H)	\$2,592	Yes
2009	36 hrs x 10 students x \$12/hr (July 4-H)	\$4,320	Yes
2009	52 hrs x 10 students x \$12/hr (4-H workshops)	\$6,240	Yes
2009	Projector donated by Sierra Club	\$297	Yes
2009	Horse kits (12 x \$150) from Sandoval County Extension	\$1,800	Yes
2009	Horse Supplies (Quivira grant)	\$1,089	Yes
2009	Computer equipment, maps, books—Quivira grant	\$2,311	Yes
2009	Watson--Horse Inventory (80 hrs x \$18.77/hr)	\$1,502	Yes
2009	Printing, postage, 2 newsletters--Sierra Club grant	\$2,718	Yes
2009	Outreach (Watson) paid for by Quivira+travel	\$2,515+\$729	Yes
2009	Watering, feeding horses (65 hrs x \$18.77/hr)	\$1,220	Yes
2009	PZP training (Tammy 45 hrs)—Quivira Grant + travel	\$845+\$744	Yes
2009	4-H Coordinator—Quivira Grant+travel (165 hrs)	\$3,096+\$1,393	Yes
2009	Hauling water for horses (194 hrs)+travel	\$3,641+\$652	Yes
2009	Horse round-up 228 hrs (10 participants)	\$4,280	Yes
2009	Gelding clinic (3 participants x 10 hrs)	\$563	Yes
2010	4-H Coordinator—Quivira Grant+travel (398 hrs)	\$7,471+\$2,459	Yes
2010	20 hrs x 12 students x \$12/hr (winter program)	\$2,880	Yes
2010	Supplies and trainers for Horse Expo (Quivira)	\$2,252	Yes
2010	Materials for Horse chute (Quivira)+travel	\$3,000+\$184	Yes
2010	Hauling water for horses (128 hrs)+travel	\$2,404+\$379	Yes
2010	Kids at 4-H parade (11 x 5 hrs)	\$1,032	Yes
2010	Concession training Horse Expo (4 x 8 hrs) + travel	\$601+368	Yes
2010	Concession vols Horse Expo (3 x 8 hrs) + travel	\$450+\$115	Yes
2010	Horse Expo participants (35 x 6 hrs)+ travel	\$3,942+\$805	Yes
2010	Participants at Gelding, PZP weekend (20 x 6 hrs) + travel	\$2,252+460	Yes
2010	Horse Show (5 kids x 13 hrs)	\$1,220	Yes
2010	Travel, Tammy, Quivira for Horse Expo (Quivira)	\$236	Yes

2010	Outreach (Watson) paid for by Quivira+travel	\$3,940+\$1,192	Yes
2010	Tammy presentation to 400 at Quivira conf.	\$7,508	Yes
2010	Tyffany, Rochelle present to 200 at Watershed Forum	\$3,754	Yes
2010	Lodging, exhibit, book, Quivira Conf. (by Quivira)	\$1,266	Yes
2010	Americorps Summer Intern -- 300 hrs for website	\$5,631	Yes
2011	First Nations Grant for Hasbidito Development	\$25,000	Yes
2011	McCune grant for Community Kitchen	\$1,500	Yes
2011	UNM Food meeting (8 x 3 hrs)	\$450	Yes
2011	Tammy present to 25 @ Farm to Table Conf.	\$469	Yes
2011	Tyffany present to 200 @ Quivira Conf.	\$3,754	Yes
2012	First Nations NAFSI grant for Com. Kitchen	\$25,000	Yes
2012	OSM/VISTA volunteer (500 hrs @ \$18.77)	\$9,385	Yes
2013	OSM/VISTA volunteer (500 hrs @ \$18.77)	\$9,385	Yes
	<b>TOTAL</b>	<b>\$189,653</b>	<b>\$189,653</b>

**Deliverables.** We created a website, produced seven newsletters, purchased 150 *Living with Livestock* books (and continue to distribute them), conducted a 4-H program for three years, educated the community about the horse problem at Ojo and about possible solutions (such as PZP and gelding), helped Rincon Marques ranchers with grazing plans, and helped to build capacity for Hasbídító to begin programs to increase access to healthy food. We worked with Americorps to receive a three-year commitment for an OSM/VISTA and are now applying for another three-year VISTA to help Hasbídító. We listened to the concerns of the community and are trying to help them create economic development opportunities while achieving increased access to healthy food through land restoration.

### **Task 7. Monitoring:**

#### **Subtasks 1 and 5**

**Status**            **Completed**

**2008.** RPA began developing a Quality Assurance Project Plan (QAPP) in April 2008. The QAPP was approved by EPA June 27. Under the Quality Management Plan, Mike Matush of the New Mexico Environment Department was RPA's Quality Assurance Manager. In June, he resigned from that position and Dave Mattern, a hydrologist with the BLM, took over. A new signature page for the QAPP was being drafted and signed.

The extensive work on the QAPP was not anticipated during drafting of the workplan, as we had an approved QAPP from the Rio Puerco Watershed Initiative grant. However, in discussions with the EPA, it was decided that we would employ a targeted monitoring design that measures both project- and watershed-level response to management. It was hoped that the monitoring design would put into operation the ability to attribute water quality changes to implementation measures of the project. Data that we have for sediment from the Arroyo Chico basin is at least 10 years old, as the

USGS Arroyo Chico gauging station is no longer functional. In addition, that number is from the entire Arroyo Chico basin, which drains 1,390 square miles. Our project is 120 square miles in Upper Torreon Wash. Therefore, we intended to monitor project effects in that localized area as well as put into place the ability to measure effects downstream of the project area that might result from our activities.

Due to the complex nature of the measurements envisioned, it was determined that the USGS was the only group experienced enough to help us achieve what we want to achieve.

In February, the monitoring task leader and the NMED representative conducted a field tour to the project area with several members of the USGS New Mexico Water Science Center (Albuquerque). The focus was on examining land forms, geology, soils, erosion patterns, and stream channel types. The same group met at the USGS office on three separate occasions to develop a scope of work. In general, the monitoring effort will be geared toward the overall data collection strategy developed by USGS, but carried out (under QAPP guidelines) by various parties including USGS, Navajo contractors, and a land surveying contractor. The division of labor among the different parties is necessary to achieve the maximum amount of watershed understanding in the most cost-effective manner. The last field meeting with USGS was on July 14 to examine potential monitoring sites.

There was a Watershed Forum in Albuquerque on September 30 and October 1, funded by the EPA. At lunch on September 30, Steve Fischer of the BLM and RPA Board, Barbara Johnson, Executive Director of the RPA, Anne Marie Matherne of the USGS, and Brad Lamb and Nelly Smith of the EPA met to discuss the monitoring objectives and methods for this project. The USGS was concerned that they would not be able to give the information the EPA wants for a large area because there would be too many confounding elements. The discussion focused on using very small, paired watersheds, not the ones originally considered. EPA seemed OK with this.

We developed a contract with USGS in December. (The Scope of Work is attached as Appendix 48.)

We considered two paired watersheds in which to conduct monitoring. The idea was to have one paired watershed study and a replicate. The areas were near roadwork and had erosion control in one of each of the paired watersheds. According to the scope of work, USGS was to perform the following tasks:

**Table 1. Upland Scale Tasks**

Task #	Task Element
(1) Baseline data	<ul style="list-style-type: none"> <li>a) Install 2 Crest Stage Gages (CSGs) without pressure transducers at yet to be determined paired upland watersheds (treated and untreated)</li> <li>b) Install a multi-level single-stage sediment sampler at each CSG location</li> <li>c) Install a precipitation gage at each CSG</li> </ul>
(2) Focus on channel stability	<ul style="list-style-type: none"> <li>a) Establish and survey 10 monumented cross-sections along the axis of each paired watershed</li> </ul>

**Table 2. Channel Scale Tasks**

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Task #	Task Element
(1) Baseline data	a) Install one Crest-Stage Gage (CSG) with a pressure transducer, downstream of the paired watersheds on one of the main stem channels of the Torreon Wash watershed (dependent on location of paired watersheds). b) Install a manual precipitation gage at the CSG
(2) Channel characterization	a) Survey successive longitudinal profiles of the main stem channel above the CSG b) Establish and survey 10 monumented cross-sections at locations that appear to be actively adjusting

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**Upland Scale Task (1) Analysis and Interpretation**

The USGS will use the newly established stage-discharge relationships to estimate discharge for each gage-height measurement. This streamflow data will be correlated with the precipitation and sediment data to establish a relationship between rainfall and stream flow events with sediment mobilization in treated verses untreated basins over time.

Task 2) Focus on channel stability

a) Compare changes over time in channel morphology in the treated and untreated watersheds.

Establish and survey about 10 cross-sections at approximately equal spacing along the axis of each of the paired watersheds. Exact spacing and number of cross-sections will be based on site inspections. Cross-sections will be resurveyed at the end of the fourth year of the project. This element will be carried out by a private contractor with input from USGS.

A comparison of the 4-year time series survey data will be conducted to measure development of or absence of trends in channel adjustment. Long-term effects of watershed restoration should be expressed as more stable channel banks characterized by vegetation growth on the banks and a rounded, channel cross-section. A channel is unlikely to completely adjust to hillslope mitigation in the watershed within 5 years. The data sets will form the basis for a long-term study of the effects of watershed mitigation on channel stability.

**Channel Scale**

Task (1) Baseline data –Establish baseline flow and sediment concentration at Torreon Wash basin outlet

a) Establish one CSG with a pressure transducer (Waltemeyer and Moore, 2005) downstream of the paired watersheds on one of the main stem channels of the Torreon Wash watershed. The selection of this site will be somewhat

dependent upon the paired watershed location. The site will be selected by the USGS and installed by the RPA. This CSG is not tied directly to the paired watershed CSGs, but is intended to measure larger-scale effects. The site will be surveyed by a private contractor (Appendix A). A Stage-discharge relation model based on the survey will be established by the USGS (Kennedy, 1984).

b) Install a precipitation gage at each CSG. Data will be supplemented with U.S. Weather Service NEXRAD data.

CSG flow data will be collected by a local volunteer/contractor on a similar schedule and following the same protocols as for the paired-basin sites. Volunteer/contractor training, sample analysis, and data processing, review and storage are the same as for the upland sites.

The USGS will use the newly established stage-discharge relationship to estimate discharge for each gage-height measurement. This streamflow data will be correlated over time with the precipitation and sediment data, to establish a relationship between rainfall and stream flow events with sediment mobilization.

#### Task (2) Channel characterization

a) Survey, longitudinal profiles of the main-stem channel from the CSG location, upstream to the basin divide. The channel will be surveyed a minimum of twice, at the beginning and end of the project. The channel will be surveyed by a private contractor; the data will be analyzed by the USGS. Based on channel morphology, the USGS will identify channel reaches where sediment appears to be actively eroding or depositing, either as bank adjustments or as bedload moving through the system.

b) Establish and survey 10 monumented cross-sections at locations that appear to be actively adjusting. Monumented cross-sections will be established and surveyed, based on the longitudinal profile. The cross-sections will be surveyed in Year 1 and Year 4 of the project. The cross-sections will be surveyed by a private contractor; the data will be analyzed by the USGS.

The channel scale project elements will establish baseline data for flow in Torreon Wash, and begin to characterize sediment movement and channel evolution on the main stem of the watershed.



*Different views of one paired watershed site. (Photos courtesy of Watson Castillo.)*

**2009.** We reviewed the potential paired watershed study sites (see photos, Appendix 49) that were looked at, and discussed at the Steering Committee Meeting which would be best for monitoring. Where, for example, would we put the instruments that need to be in place to monitor some factors like sediment? We determined that they might need to be fenced to keep grazing animals away from them. We also discussed having the USGS help to train students and landowners about the equipment, the purpose of monitoring, and how to read the instruments.

The Steering Committee discussed how each site would be monitored, i.e., doing topographic and vegetation monitoring for the shallower sites and sediment sampling in the deeper sites.

The USGS liked a site in the Penistaja Arroyo for the deeper paired watershed site, but we took one more field trip to pick the shallower site. Ellen Soles began with an

intensive survey of the area in late April and instrumentation was installed.

From the USGS quarterly report of June 2009:

**Objectives:** The objectives of the proposed study are: (1) to determine if the results of watershed mitigation and improvement practices can be detected as a decrease in sediment delivery at the basin outlet and (2) to develop and implement a monitoring strategy that will be able to detect long-term changes in downstream sediment load, even if these changes are not detectable in the short-term.

**Significant findings and progress during the quarter:** Drainage basin pairs were selected at two locations, the Penistaja and the Torreon Tributary sites. Each drainage basin pair will consist of a treated and an untreated basin. A crest stage gage (CSG) with a transducer and single-stage sediment samplers were installed at the downstream ends of the treated and untreated drainage basins at the Penistaja site. A tipping-bucket rain gage was installed between the two drainages.

At the Torreon Tributary site, the shallow channels could not accommodate sediment samplers. Instead, CSG's with transducers were installed at the upstream and downstream end of a channel reach on the treated and untreated drainages to test for a decreased volume of runoff following treatment. A tipping-bucket rain gage was installed at the treated drainage.

The treated and untreated drainage basins at the Penistaja site and the treated Torreon drainage were surveyed by a contractor. The remaining survey will be completed next quarter.

On the mainstem Penistaja, a CSG and single-stage sediment sampler were installed on an abandoned bridge pier; the instrumentation was surveyed to establish relative elevations for a rating curve.

A 1.3 inch rainfall on June 9 to 10, 2009, was recorded at both sites. At the Penistaja site, the CSG's recorded flow and about 20 cm<sup>3</sup> of sample was collected by sediment samplers on both the treated and the untreated drainage. This is not sufficient sample for a reliable measurement of suspended sediment, and will not be analyzed, but does indicate that the equipment was functioning.

At the Torreon Tributary site, sediment captured by a channel treatment downstream of the upstream CSG covered the base of the CSG housing. The gage housing was adjusted by moving it upward on the fence post base, and measurements were taken to determine the datum shift.

During the rest of 2009, a longitudinal profile of the Penistaja channel was surveyed and the results used to select locations for cross-sectional surveys by a contractor.

The CSG's were moved upstream of their present location to a more channelized reach. This drainage was surveyed by a contractor.

Forms to be used in site visits were finalized. Two students have been partially trained to collect data from monitoring equipment.

We ordered soil moisture probes to be installed and a protocol for adding that information into our monitoring design study will be developed. We had to amend the QAPP.

**2010.** From the USGS reports:

- Streamflow, sediment, and precipitation data were collected at all sites (Torreon trib, paired watershed, and Penistaja trib. Paired watershed and Penistaja main stem).
- A field visit and follow up training session was conducted by both project chiefs with the resident volunteers.
- An in-house technical review of the project was conducted by the New Mexico Science Center Specialists and supervisors on February 2.
- A site visit was conducted by both project chiefs to review the monitoring sites and equipment setup. The project chiefs reviewed monitoring techniques with the volunteers, and discussed questions and concerns regarding the project. Volunteers were trained in down-loading transducers and tipping bucket rain gages using the small computer.
- The small computer was carried to the Watershed Forum, and USGS downloaded all files collected by volunteers to date. USGS received an update on monitoring volunteer activities and plans for fall as training for a new volunteer proceeds.
- A presentation regarding monitoring activities was presented by Ryan Yazzie, a monitoring volunteer, to the Ojo Encino Ranchers' Committee. Ryan also gave a field tour and demonstration of techniques to a group from Regional EPA Headquarters. Tyfanny Herrera, a former monitoring volunteer, discussed monitoring efforts in a talk delivered at the New Mexico Watershed Forum.
- USGS met with RPA Executive Director and Brad Lamb of EPA to clarify EPA expectations for final monitoring report by RPA. Mr. Lamb emphasized the need to extrapolate small-scale results to potential effects on TMDL levels in Torreon Wash.
- USGS attended training in the EPA BASINS/HSPF watershed model for potential use in evaluation of Torreon Wash.
- Generation of rating curves and annotated report outline were not completed this quarter due to obligations with other projects.

**2011.** From the USGS reports:

- Streamflow, and precipitation data were collected by volunteers at all sites (Torreon tributary, paired watershed, Penistaja tributary paired watershed, and Penistaja main stem).
- USGS received an update on monitoring volunteer activities.
- USGS met with monitoring volunteer at Quivira Coalition conference in Albuquerque on November 10 and uploaded data collected during the fall.
- Generation of rating curves was not completed this quarter due to obligations with other projects.
- Annotated outline of proposed report was developed.

- USGS attended the Ranchers' Meeting in late March.
- There were problems with the small computer in late March. The programs and data associated with the transducers were missing from the computer. Some data were lost but all data were transferred to USGS last quarter and no precipitation events were observed since that time, so it is probable that data loss was minimal. The computer was serviced by the USGS IT team and the software programs reloaded. The computer was returned to the volunteers. The problem was thought to be due to a battery glitch which reset the computer clock, and not to a permanent problem. As backup, the volunteers were given a jump drive and asked to transfer data from the computer after each site visit in which data is downloaded from the transducers.
- A replacement transducer was purchased by RPA for the Penistaja main stem crest-stage gage last quarter. On visiting the Penistaja main stem site after the Ranchers' Meeting to install the new transducer in the crest-stage gage, it was discovered that the bridge and the crest-stage gage attached to a bridge pier had been removed. Remaining was the pier to which the sediment sampler bottles were attached. The bottles and the framework attached to the pier were also present. The new transducer was initialized and installed in the lower left hand corner of the sediment-sampler framework, and secured with zip-ties passed around the transducer and through holes drilled in the wooden frame. A bolt in the wooden frame was used as a benchmark in the original site survey, so it will be possible to tie the new location and elevation to the original survey. The original transducer was recovered from the streambank, where it had been abandoned, and was given to the monitoring volunteers as a backup, should there be problems with any of the other transducers.
- Addition of gage sites to database and generation of rating curves was not completed this quarter due to issues with delineating drainage basins at the upper end where the basins intersect cliff faces.
- We have gotten some information from the soil moisture probes we installed, that show twice as much moisture behind our structures in the treated watershed in the paired watershed area as in the untreated area (12% vs. 6%, which is a big difference considering how little rain the area has received this year). The USGS wants to have another full field season to gather information, so we will be requesting an extension to compete that next year.
- USGS gave a presentation on the objectives and status of the project at the Rio Puerco Alliance meeting in December, 2011.
- A new crest-stage gage was installed at the previous Penistaja mainstem location on September 16, 2011. Installation of a pressure transducer and acquisition of levels for the new gage were planned for this quarter but not accomplished because of scheduling conflicts.

**2012.** From the USGS reports:

- Streamflow and precipitation data were collected by volunteers at all sites (Torreon tributary paired watershed, Penistaja tributary paired watershed, and Penistaja main stem).

- Discussions with Barbara Johnson regarding scheduling survey of sites in Fall, 2012.
- Completed extension of funding agreement through FY2013.
- Delivered talk about project at RPMC Next Steps Meeting with Senator Bingaman.



*Before (left) and after (below) pictures at one of the paired watershed sites where the summer youth installed one-rock dams and media lunas. (Photos courtesy of Watson Castillo.)*



**2013.** The analysis of the data was completed and will be published as a USGS Technical Report next year. The Report is still a draft and therefore cannot be attached to this report. The EPA has access to it for colleague review.

**Subtask 2 and 4**

**Status**      **Completed**

**2008.** We contracted with Ellen Soles of NAU to complete this Subtask. She completed the first part of her field work and its analysis in 2008. Per her Statement of Work, the first part of her contract involved:

“The Penistaja Arroyo channel survey is located in Sec. 29, T20N R4W. The channel survey will extend longitudinally 1200-1500 feet upstream and downstream of a crest stage gage (CSG) to be mounted at an existing bridge in the survey reach. CSG installation is not included in this SOW.

**Survey Methods and Specifications.** The contractor will complete field mapping data collection to deliver high-accuracy data and maps appropriate to project evaluation goals for each surveyed site. Field work will be conducted by standard plane surveying methods, using a Topcon GTS total station (6-sec accuracy), data logger, and high-accuracy GPS (Trimble GeoExplorer II). Survey data will be collected in U.S. survey feet based on an initial arbitrary grid and datum, with a scale factor appropriate to the site for later conversion to New Mexico state plane coordinates. Waypoint-averaged GPS locations will be identified for at least three survey control points at each site. These will be used to transform the arbitrary survey grid coordinates to the NM State Plane grid system. (Transformation to UTM coordinates/NAD83 may also be performed if requested by the contractor responsible for hydrologic modeling.) GPS coordinates will provide a sufficient level of positional accuracy to place each surveyed area within +/- 3 ground feet. Internal survey precision will be +/- 0.05 feet. The contractor will record measurements and notes according to standard convention, along with photographic documentation of important site and control features. Fieldwork and data collection activities will minimize impacts to vegetation, soils, and cultural features.

“A. Penistaja Arroyo site: Channel morphology and the immediate floodplain area will be surveyed at sufficient intensity to produce accurate maps at 1-ft. contour intervals.

“C. Torreon Wash cross-section: The cross-section will be 600-800 feet long, extending well onto the terrace surface on each side of the active channel. Endpoints will be marked with standard 5-ft. T-posts, driven as deeply as possible into the ground and labeled with identification information. At least two permanent reference marks will be located and/or installed and surveyed to ensure repeatability in future comparative surveys. Channel morphology will be surveyed at sufficient intensity to capture the thalweg and all significant slope breaks across terrace, floodplain, channel bank, and channel bottom surfaces. Appropriate points (top lip and ground surface) on four piezometers to be installed along the cross-section line will also be surveyed. Cross-section data will be supplied in standard station/elevation format and will include relevant piezometer elevations (top lip/measuring point, bottom, measured water surface). Data collection is tentatively scheduled to be conducted between August 9 and 18, 2008.”

**2009.** Ellen completed the first part of her field work and installed piezometers in July. In August-December, she compiled all data from surveys of six sets of 12 cross-sections, Torreon and Penistaja main channels, locations designated by USGS and produced spreadsheets in standard stationing/elevation format. She provided site photo documentation. She constructed data sheets for use in manual piezometer measurements and conversions to groundwater surface elevation. She provided measurements from piezometer installations in July 2009. She compiled all survey data,

maps, and derived profile/cross-section data for Torreon paired watersheds and provided site photo documentation. (See Appendix 50.)

**2012.** These transects were re-surveyed in November 2012. The report was received and sent on to the USGS. (The Report is Appendix 51.)

**Subtask 3**

**Status**            **Completed**

This was completed under Task 2 in 2009. See Appendix 10.

**Funding Leveraged.**

<b>Year</b>	<b>Source</b>	<b>Amount</b>	<b>Match</b>
2008	Supplies	\$9,687	Yes
2008	Matush 40 hrs@ \$18.77/hr	\$751	Yes
2010	Travel—Sierra Club grant (54 mi x \$.46)	\$25	Yes
2011	Watson: 43 hrs @ \$18.77	\$800	Yes
2012	Watson: 32 hrs @ \$18.77	\$608	Yes
2012	USGS Presentation at RPMC mtg (15 x \$18.77)	\$282	Yes
2013	Final Monitoring (Ellen—RERI grant)	\$3,238	Yes
	<b>TOTAL</b>	<b>\$15,391</b>	<b>\$15,391</b>

**Deliverables.** From the Abstract of the USGS Monitoring Report: “Sediment erosion and deposition in two sets of paired (treated and untreated) upland watersheds in Torreon Wash watershed, upper Rio Puerco basin, New Mexico, were examined over a 3 ½-year period from spring 2009 through fall 2012. The objective was to evaluate the effectiveness of upland mitigation methods and their potential utility in improving watershed health and decreasing the suspended sediment concentration of in-channel flows in the lower ephemeral stream channels. Downstream changes in channel cross-section in the mainstem Penistaja Arroyo and Torreon Wash were also examined.

“For both watershed pairs, aggradation in the active areas close to the channel was greater in the treated compared to the control watershed. Erosion was the dominant geomorphic process only in the untreated Penistaja Arroyo tributary, while aggradation was the dominant process in the other three watersheds. For Penistaja Arroyo tributary, the treated channel showed a 51 percent increase in area aggraded over the control channel, while volume aggraded per area analyzed increased by 67 percent. Both Torreon Wash tributary channels showed net aggradation; the treated channel, however, showed a 29 percent increase in area aggraded over the control channel, and a 60 percent increase in volume aggraded per area analyzed. In the untreated Penistaja Arroyo tributary channel, the calculated minimum erosion rate was 0.14 mm/yr. Aggradation rates for the three channels where aggradation was the dominant geomorphic process were calculated at 0.16 mm/yr for the Penistaja Arroyo tributary treated watershed, 0.31 mm/yr for the Torreon Wash tributary untreated watershed, and 2.51 mm/yr for the Torreon wash tributary treated watershed.

“In Penisteja Arroyo and Torreon Wash, channel slumping and erosion and transport of previously deposited material provide source material for sediment

suspended in the ephemeral flow. Hillslopes produce source material likely not as diffuse overland flow from hillslope erosion to Penistaja Arroyo and Torreon Wash, but by transport in established or incipient drainages or gullies such as measured by the paired watersheds. By increasing the infiltration capacity of the hillslopes and limiting the tendency towards increased drainage density, with its more efficient conveyance of runoff and sediment, hillslope stabilization through mitigation structures such as one-rock dams increases the capacity of the landscape to absorb and limit the erosive impact of more moderate, more frequent precipitation events.”

**Task 8. Administration:**

**Status**

**Completed**



**2008.** We constituted a Steering Committee composed of representatives from the BLM, New Mexico State Forestry, Watershed Division, the Navajo Nation Water Resources Branch, the Ojo Encino Ranchers Committee, the Quivira Coalition, the New Mexico State Environment Department, Hub RC&D, and the RPA. The representative from the NM State Land Office had to resign due to other commitments. We held three Steering Committee Meetings in 2008 and a “Task Integration Meeting” with some Steering Committee members and contractors on June 18, 2008 at Ojo Encino Chapter to discuss how we would decide on areas to be worked on. We decided on the factors to use in determining treatment area priority: Integration of Project Elements; Severity of Erosion; and Other. We talked about how the work would be monitored. (See Appendix 52 for Task Integration chart.)

The Project Coordinator let 14 contracts, purchased supplies for on-the-ground work, and communicated with contractors on a regular basis. She sent minutes of Steering Committee meetings and updates on the project to both the Steering Committee and the RPA Board. We sent a letter to all contractors at the end of FY2008, giving them the status of their contract and what we would be expecting from them in FY2009. We installed and set up Quick Books to more efficiently track expenditures, etc. We have amended contracts when conditions changed.

The original RPMC Outreach Coordinator decided to leave her position and return to school. Work under the workplan that was to have been done by the RPMC Outreach Coordinator was divided up among other contractors, such as the Quivira Coalition. Some of that work fell to the Project Coordinator, who tried to review progress in the field at least once a month.

We amended the workplan budget in FY2008.

**2009.** We held a Steering Committee meeting at Tinian Baptist Church (see picture above), and we met some of the students who had been involved in the erosion control program. They took us to the Anthill site and we discussed with them the structures they were making and other things they might be able to do. We invited them to a field trip that the RPMC was having to the Cuba YCC work area.

**2010.** We also needed to make changes in the workplan for the final field season. We needed to move money from some categories and into others. We needed to change some of what we would be doing, due to changed conditions on the ground. We held another Steering Committee meeting (Minutes and Agendas of all Steering Committee Meetings are attached as Appendix 53).

Our EPA Project and Technical staff visited the project site in September 2010. After we fed them lunch at the Chapter House, we visited the paired watershed site and Ryan Yazzie, our principal Navajo monitoring contractor, explained the information he was collecting for the USGS. We also took them to R18 to see the erosion control, headcut, and road work done there in the last quarter and this one. (See photos, Appendix 54.)

**2011.** The QMP was originally submitted in 2008, but was amended in 2009 when our Quality Assurance Manager changed. It was amended again in 2011 when we got another quality assurance manager (Appendix 55). The QAPP (Appendix 56) was

submitted and approved in 2008 and updated in 2011, submitted to the EPA, and approved. The QAPP is effective until September 27, 2014.

**2012-2013.** We extended the grant period one year (from September 2012 to September 2013) so we could obtain more monitoring data. We also extended our contract with the USGS for them to gather the data and produce a report.

Over the six years of the project, we completed 21 Quarterly Reports. They are attached as Appendix 57. We completed this Final Report on the project.

**Funding Leveraged.**

<b>Year</b>	<b>Source</b>	<b>Amount</b>	<b>Match</b>
2008	3 Steering Com Mtgs+travel	\$7,771+\$1,058	Yes
2009	3 Steering Com Mtgs+travel	\$2,815+\$1,150	Yes
2009	ED travel—Sierra Club grant	\$488	Yes
2010	Steering Com Mtg + travel	\$788+\$322	Yes
2010	ED travel—Sierra Club grant	\$500	Yes
	<b>TOTAL</b>	<b>\$14,592</b>	<b>\$14,592</b>

**Deliverables.** Steering Committee established and seven meetings held; contracts let and their progress monitored; QMP and QAPP developed; workplan amend; grant period extended; 21 quarterly reports made and one Final Report.

**TOTAL Funding Leveraged**

<b>Year</b>	<b>Task</b>	<b>Amount</b>	<b>Match</b>
2008	1	\$31,049	Yes
2008	2	\$1,314	Yes
2008	3	\$10,868	Yes
2008	4	\$4,861	Yes
2008	6	\$20,232	Yes
2008	7	\$10,438	Yes
2008	8	\$8,829	Yes
2009	1	\$28,798	Yes
2009	3	\$7,249	Yes
2009	4	\$14,227	Yes
2009	5	\$7,047	Yes
2009	6	\$45,427	Yes
2009	8	\$4,453	Yes
2010	1	\$32,039	Yes
2010	3	\$9,206	Yes
2010	4	\$14,085	Yes
2010	5	\$6,788	Yes
2010	6	\$55,801	Yes
2010	7	\$25	Yes
2010	8	\$1,610	Yes
2011	1	\$23,165	Yes

2011	1	\$10,000	No/Federal
2011	3	\$27,727	Yes
2011	3	\$10,000	No/Federal
2011	4	\$6,714	Yes
2011	5	\$9,070	Yes
2011	6	\$31,173	Yes
2011	7	\$800	Yes
2012	1	\$30,500	Yes
2012	1	\$25,000	No/Federal
2012	3	\$19,833	Yes
2012	3	\$10,000	No/Federal
2012	4	\$5,261	Yes
2012	5	\$50,000	No/Federal
2012	6	\$34,385	Yes
2012	7	\$890	Yes
2013	1	\$59,388	Yes
2013	1	\$10,000	No/Federal
2013	3	\$27,225	Yes
2013	4	\$4,817	Yes
2013	5	\$10,000	No/Federal
2013	6	\$9,385	Yes
2013	7	\$3,238	Yes
<b>Total</b>		<b>\$732,917</b>	<b>\$607,917</b>

## OUTPUTS AND OUTCOMES

Description	Anticipated Output	Anticipated Outcome	Final Output	Final Outcome
<p><b>Task 1. Subtask 1:</b> Erosion control structures will be installed by summer youth program workers under the direction of an erosion control specialist.</p>	<p>Many erosion control structures will be installed to reduce sediment and hold water in the soil. Students and their parents will learn about water harvesting and erosion control and about how they can make their community more productive.</p>	<p>Measurable captured/stabilized sediment in project sites and measurably more water retained, producing more vegetation to hold more soil and feed wildlife and domestic animals. Increase in community members who use similar practices on their land. Approximately 1,500 erosion control structures retaining 1.5 cu ft</p>	<p>Over 2,000 erosion control structures constructed and maintained. Many students have learned how to construct and site the structures.</p>	<p>60-66% sediment retained on land. Stabilization of watershed.</p>

		of sediment each = 113 tons of sediment retained.		
<b>Task 1. Subtask 2:</b> Volunteers from the community, under the supervision of an erosion control expert, will install low-tech structures to inhibit headcuts in and adjacent to Torreon Wash in project area.	Headcut structures will be installed to stop gullyng and erosion in Torreon Wash. Volunteers will learn these techniques.	Measurably less sediment in waterways in terms of erosion prevented, localized improvement in water quality. Increase in community members who use similar practices on their land. Approx. 122 tons of sediment retained.	Headcut workshop, headcut work, some done by Summer Youth crews and some done by contractors.	Reduction in sediment.
<b>Task 2. Subtask 1:</b> We will assess roads in the project area and develop designs for remediation. We will work with landowners, the Navajo Nation, BIA, and applicable Counties to change current road construction and maintenance methods.	During the assessment, members of the community will learn about roads and their impact on the land, as well as simple methods for improving them. The Navajo Nation, the Counties, and BIA will learn about simple and inexpensive methods of improving roads.	New road construction and maintenance methods will be instituted in the Nation and the counties, thereby reducing unnatural sediment delivery into Torreon Wash and its tributaries.	Community members have learned about the benefits of proper road construction.	We have not been successful in engaging the Navajo Nation, BIA, and Counties.
<b>Task 2. Subtask 2:</b> We will remediate approximately 30 miles of road within Torreon Wash using methods such as: --Construction of rolling dips, waterbars, outloped sections, grade breaks, cross drains, to minimize accumulation of runoff on the road surface. --Construction of short	Thirty miles of road will be improved through the use of simple and relatively inexpensive methods. The "model" road section will show community members every day the benefits	Measurably less sediment coming off roads in terms of sediment delivered to streams. More awareness of roads and road problems and their contribution to watershed health. Approximately .35 cu ft per 500 ft of road x 30 miles = 5.5 tons of sediment	38 miles of road remediated under TWG, more under NNEPA project. 25 miles of road closed. Several area residents were trained in the remediation	A 48% decrease in sediment from roads after remediation. On an annual basis, road erosion was reduced from 76,005 pounds per year to 41,419

<p>downhill approaches at low-water crossings where the watercourse is being “captured” by the road surface.</p> <p>--Realigning dirt roads that cross drainage channels at an appropriate angle.</p> <p>--Realignment, relocation, or rebuilding problem road segments in order to lessen the grade or provide more favorable drainage options.</p> <p>--Properly closing and reclaiming abandoned roads.</p>	<p>of this type of improvement in their roads. Navajo assistants will be trained in these methods so that the Navajo Nation will have the capacity for making these improvements.</p>	<p>retained.</p>	<p>techniques.</p>	<p>pounds per year.</p>
<p><b>Task 3. Subtask 1:</b> We will assess riparian areas with volunteers to identify sites where vegetative conditions are contributing to, or failing to provide protection from, erosion.</p>	<p>A map of sites where vegetative conditions are contributing to erosion. Information about proper riparian functioning will be disseminated to the volunteers.</p>	<p>More awareness in the community of the benefits of proper riparian functioning. Increase in riparian habitat and increase in channel stability.</p>	<p>Community members were involved in all 6 years of planting.</p>	<p>Children and community members have learned about benefits of proper riparian functioning.</p>
<p><b>Task 3. Subtask 2:</b> We will mitigate sites where vegetative conditions are contributing to, or failing to provide protection from, erosion through the establishment of proper native species along banks, and in floodplains. Exclosures will be constructed around native vegetation such as willows and cottonwoods that are planted.</p>	<p>We will map and summarize the sites, including a discussion of the native species planted. A typical application could be to protect an eroding arroyo bank that is 6-10 feet high, 200 feet long, with a 1 foot-per-year retreat rate would result in saving 74 cubic</p>	<p>The establishment of proper native species will contribute to keeping soils, banks, and floodplains in place and functioning properly. Increase in channel stability and riparian habitat. Approximately 1,000 tons of sediment retained.</p>	<p>2,500 cottonwoods, 1,000 riparian shrubs, and innumerable willows planted.</p>	<p>Torreon Wash and tributaries are beginning to create new meander patterns. 65% survival on plantings.</p>

	yards of sediments from collapsing into the arroyo each year.			
<b>Task 3. Subtask 3:</b> The BLM and BIA will map and remove non-native vegetation along Torreon Wash.	Removal of non-native vegetation.	Improved condition of riparian areas, reduced erosion, increase in native vegetation.	The Navajo Nation mapped the salt cedar and the BIA treated it.	The BIA has asked for our help in replanting treated areas with native vegetation.
<b>Task 4. Subtask 1:</b> The New Ranch Network will continue to help area ranchers to develop and implement grazing management plans on their land.	Grazing Management plans will be developed and implemented to increase vegetation and improve the health of the land.	Increase in number of ranchers who want management plans and who institute them. Healthier land and more knowledgeable ranchers.	6 Conservation Plans have been approved by the BIA and Land Board. More are in process.	All OERC ranchers and many others are interested in creating Conservation Plans and improving their land.
<b>Task 4. Subtask 2:</b> We will establish and maintain a grassbank on a BLM allotment to provide alternative grazing to allow area ranchers to defer grazing on their land to help speed land rehabilitation under their grazing plans.	Functioning grassbank. Demonstration of new methods of grazing management.	Increase in number of allotments that have management plans by about 10. Improvements to grazing allotments that will increase vegetation and productivity and improve the health of the land and community.	We were unable to establish a grassbank as we could not get a tribal ranch. Instead, we focused on reducing the number of unmanaged horses on the range.	The horse reduction program continues. There is more interest in reducing the number of horses. The Chapter is engaged in this process.
<b>Task 5. Subtask 1:</b> We will hire a contractor and use volunteers to clean up 6 illegal dumping sites in project area.	Six illegal trash dumps cleaned.	Reduced erosion.	Three large sites and a medium sized site were cleaned up with TWG money. We cleaned up one large site and 12 smaller ones with BLM funding.	All sites have been re-contoured to reduce erosion and roads to the sites have been closed to prevent further dumping.
<b>Task 5. Subtask 2:</b>	Legal trash	Fewer illegal trash	We were	More people

<p>Educate the community on the problems with illegal trash dumping and offer them reasonable alternatives.</p>	<p>dumping facilities developed, recycling program instituted, enforcement.</p>	<p>dumps. Increase in community interest in legal solutions to trash, leading to decreased erosion. At least one convenience center established with help from Navajo Nation Solid Waste Bureau.</p>	<p>unable to build a convenience center, but we have put trash bins at Ojo Encino and Torreon Chapters.</p>	<p>are using legal trash bins, reducing the amount of illegal dumping. There is more interest here and in other areas of Eastern Navajo about instituting legal trash collection and recycling.</p>
<p><b>Task 6. Subtask 1:</b> Outreach in the community through a webpage, kiosk demonstrations, education with 4<sup>th</sup> graders, and outreach to ranchers in Rincon Marques about new grazing methods.</p>	<p>Information about watershed health and how to achieve it will be disseminated throughout the community, largely through one-to-one interaction.</p>	<p>Information about watershed health will stimulate interest in new methods to achieve it. Increase in number of ranchers who want management plans and who institute them by about 10.</p>	<p>We developed the RPA website. We worked with Rincon Marques ranchers and with Hasbidito. We developed a new Kiosk and have used it around the area and the state.</p>	<p>Through our outreach work, we have helped move residents forward on land restoration and local food programs. We have conducted a study of food and energy use in the area, helped upgrade the Ojo Encino Chapter kitchen, and began developing a Mobile Farmers Market.</p>
<p><b>Task 6. Subtask 2:</b> We will begin education about the problem of feral horses in the community through a youth program.</p>	<p>Implementation of the Feral Horse Youth Program. Ten students will be trained in horsemanship, horse health</p>	<p>This will be a start in the re-education process that is needed to reduce the impact on the land from feral horses. At least a 10% decrease in</p>	<p>We had an official 4-H program for three years. We began PZP and gelding programs.</p>	<p>Our horse inventory showed a decrease in horses in the Ojo Encino area.</p>

	management, and grazing management.	feral horses on the land.		
<b>Task 6. Subtask 3:</b> We will produce a quarterly newsletter to disseminate relevant information to landowners in the Rio Puerco Watershed, highlighting, among other things, this project.	Twelve issues of the <i>Rio Puerco News</i> , mailed to as many landowners in the Rio Puerco Watershed as we can afford to.	Information about this project and others in the Rio Puerco Watershed will encourage other landowners to investigate the methods used. Increase in those who institute them on their land.	7 newsletters printed and distributed.	Information about this project and other work in the Rio Puerco Watershed has been disseminated.
<b>Task 6. Subtask 4:</b> We will develop or reprint several publications to disseminate relevant grazing and erosion control information to the landowners in the project area.	1,000 copies of a Navajo erosion control guide. 1,000 copies of <i>Living with Livestock</i> , originally developed by the Rock Point Range Management Project in Chinle, Arizona.	Information about methods being used successfully in the Rio Puerco Watershed will be available. Increase in landowners who use them on their land.	We purchased remaining copies of <i>Living with Livestock</i> and are still distributing them.	All landowners who are working on Conservation Plans have copies of this book.
<b>Task 7. Subtask 1:</b> We will assess and model estimated surface sediment availability/movement from the entire watershed contributing to Torreon Wash at the lower project area boundary. We will evaluate plant response.	The goal is to develop and conduct a targeted monitoring program at both project- and watershed-level that detects water quality trends and cumulative effects of projects and management measures that are implemented under the project. Output products will be (1) A physically-based distributed	Concrete information on the effects of the methods we are using to determine if they have contributed to beneficial changes in the watershed, such as measurably increased vegetation, measurably decreased erosion and sediment, and measurably increased water quantity held in the soil for the benefit of vegetation.	This was done as part of a paired watershed study.	From the USGS Report Abstract: "Sediment erosion and deposition in two sets of paired (treated and untreated) upland watersheds in Torreon Wash watershed, upper Rio Puerco basin, New Mexico, were examined over a 3 1/2-year period from spring

	<p>hydrologic model to describe the watershed and predict responses to management, (2) field monitoring data to populate the model variables and document ground conditions and trend, (3) an analysis of predicted vs. observed watershed responses.</p>		<p>2009 through fall 2012. . .          .Downstream changes in channel cross-section in the mainstem Penistaja Arroyo and Torreon Wash were also examined.</p> <p>For both watershed pairs, aggradation in the active areas close to the channel was greater in the treated compared to the control watershed. . .          .</p> <p>By increasing the infiltration capacity of the hillslopes and limiting the tendency towards increased drainage density, with its more efficient conveyance of runoff and sediment, hillslope stabilization through mitigation structures such as one-rock dams</p>
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				increases the capacity of the landscape to absorb and limit the erosive impact of more moderate, more frequent precipitation events.”
<p><b>Task 7. Subtask 2:</b> Four to 6 sites along Torreon Wash and/or major tributaries will be surveyed for approximately one mile upstream and downstream of selected points to determine baseline conditions and other useful factors such as channel sediment transport.</p>	See Subtask 1.	Concrete information on the effects of the methods we are using to determine if they have contributed to beneficial changes in the watershed, such as measurably decreased erosion and sediment, and measurably increased channel stability.	These surveys were conducted in 2008 and 2009 and the areas were resurveyed in 2012.	See above.
<p><b>Task 7. Subtask 3:</b> A separate model for sediment delivery from improperly designed and/or maintained roads will be used to estimate contributions from these surfaces.</p>	See Subtask 1.	Concrete information on the effects of the methods we are using to determine if they have contributed to beneficial changes in the watershed, such as measurably decreased erosion and sediment delivery from roads.	This was done under Task 2.	See above.
<p><b>Task 7. Subtask 4:</b> Recording crest stage gages and a minimum of 3 piezometers or observation wells equipped with recording pressure transducers will be</p>	See Subtask 1.	Concrete information on the effects of the methods we are using to determine if they have contributed to beneficial changes	These gages were installed in 2009.	See above.

installed on at least 3 channel project sites.		in the watershed, such as measurably decreased erosion and sediment, and measurably increased water quantity held in the soil to benefit vegetation.		
<b>Task 7. Subtask 5:</b> Baseline flow-proportional sediment concentration sampling will be conducted by a qualified contractor under USGS protocols.	See Subtask 1.	Concrete information on the effects of the methods we are using to determine if they have contributed to beneficial changes in sediment concentrations and loads.	This was part of the USGS contract under Subtask 1.	See above.
<b>Task 8:</b> The Rio Puerco Alliance will administer the project under the guidance of the Steering Committee.	Memorandum of Understanding with the Steering Committee members, regular meetings, quarterly and final reports.	Timely and successful completion of this complex project.	Anticipated Output Achieved.	Anticipated Outcome Achieved.