EROSION PILOT PROJECT IN PLACITAS OPEN SPACE

FY16 FOURTH QUARTER AND FINAL PROJECT REPORT

Project Period: July 2015 through June 2016
Coronado Soil and Water Conservation District

View of project work team on third of four areas of the POS receiving permaculture treatment

Project PO Number P0154136, New Mexico State University
New Mexico Department of Agriculture

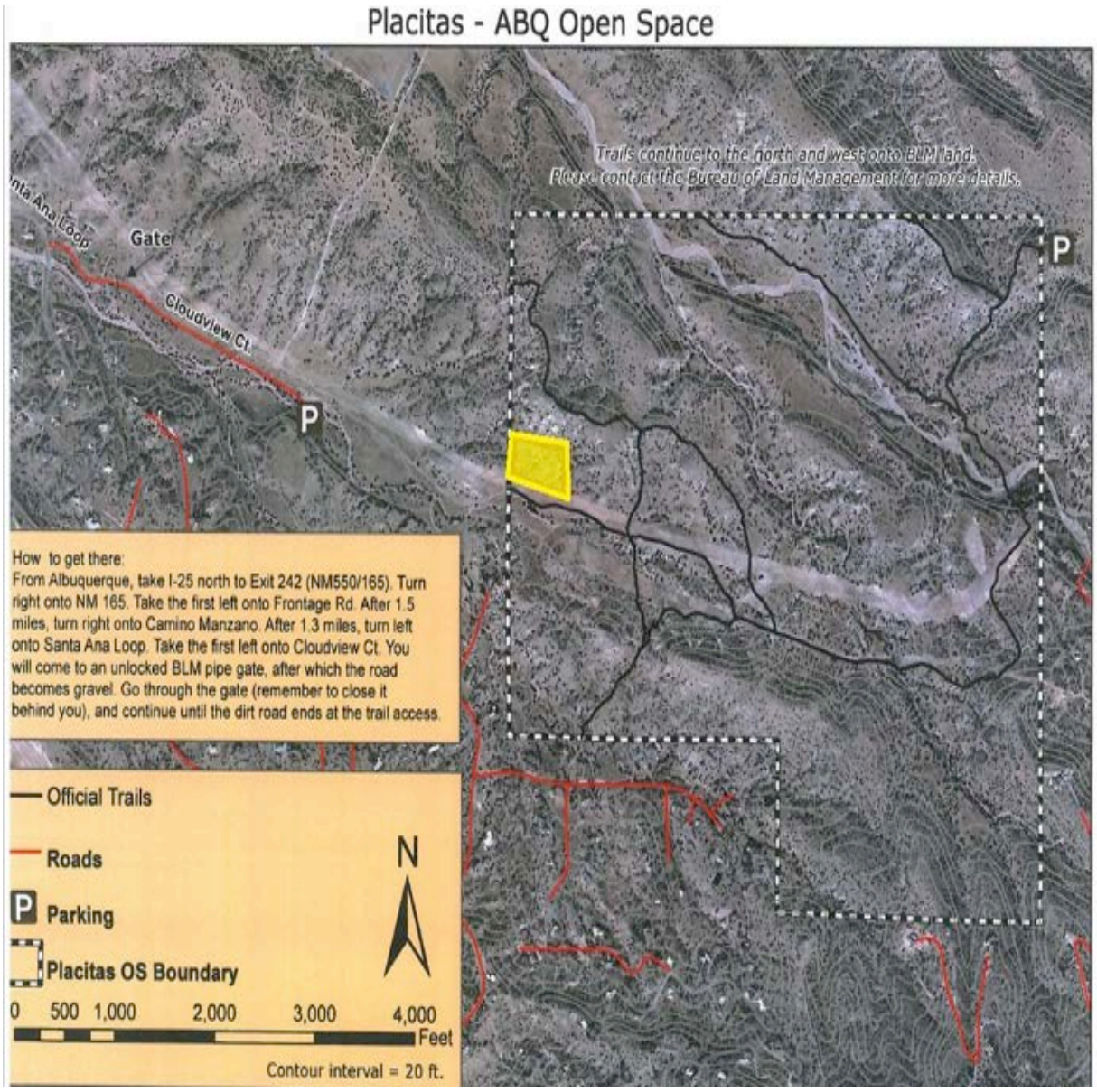
I. INTRODUCTION

This erosion-control pilot project was carried out in an area designated as the Placitas Open Space (POS). The POS is a 560-acre area in Sandoval County, managed by the City of Albuquerque Open Space Division (OSD). The POS is located in Sandoval County, in the lower part of the Las Huertas Watershed, which extends from the northeastern Sandia Mountains to the middle Rio Grande in Bernalillo. It likely serves as a wildlife corridor, along with providing for light recreation for the Placitas area residents. Its trail system is used by hikers, mountain bikers, and equestrians. A complete perimeter fence and gates were installed in March 2014 to protect the area from livestock. Outside the fenced area, the U.S. Bureau of Land Management (BLM) manages the land to the northeast; residential development characterized by mainly natural landscaping skirts about two-thirds of the boundary to the southwest.

Occasional extreme precipitation, gusting winds, drought and free roaming horses in recent years lend to the degradation of vegetation and soils. The recent ongoing drought prevents natural vegetation from recovering in an annual cycle, leaving the soils vulnerable to continuing damage. With increased run-off, flooding results in damage to residential areas to the west (Algodones) and south (Placitas subdivisions). The POS represents an area well suited to demonstrating how simple permaculture methods can be used to slow and capture run-off sheeting from hillsides that might otherwise result in erosion that is difficult to mitigate.

a. POS slope damaged with serious head cut and channel, opposite work site.

Graphic A. Placitas Open Space boundary and project site location.



The yellow object within the POS boundary is the general area of the project work site. The project volunteers approached the area on Cloudview Court to the indicated parking area. From there they made a 15 minute walk to the work site.

II. SELECTION OF THE PLACITAS OPEN SPACE

There are several factors that make the POS a good area for demonstrating whether small scale permaculture, with volunteers using hand tools, might be feasible for getting an initial toe hold on erosion control on some of the slopes. These factors include the following:

- The vision for the project comes from the chairperson of the Coronado Soil and Water Conservation District (CSWCD). He has lived in the Placitas foothills for several decades. Having watched the worsening conditions in the area over the years, he has himself been engaged in several hands-on efforts to preserve and improve elements of the watershed. He recognizes potential in the newer residents of the Placitas area foothills for commitment to keeping these foothills from melting away.

- Lower parts of the watershed have been developed into residential areas with a rural feel that have been a magnet for retirees. The neighborhoods of pueblo style houses are landscaped with native vegetation and are spread over the gravelly hillsides and alongside arroyos. Many residents are eager to learn about ways to deal with the arid climate and the consequences of the intermittent extreme precipitation.

- The leadership of the Albuquerque Division of Open Space has a history of encouraging and facilitating various groups to voluntarily engage in the improvement of the open spaces managed by the city and to promote educational use of the resources. An initial workshop to demonstrate such a method was held in 2014 under the auspices of the Albuquerque division, led by Jim Brooks of Soilutions Advanced Terrain Systems of Albuquerque. The Coronado Soil and Water Conservation District (CSWCD) enlisted Mr. Brooks to extend this effort, funded in 2015 by a Water Quality and Conservation Grant (FY16), under New Mexico Department of Agriculture

III. THE PERMACULTURE METHOD USED

The intent of the project design was to put in place a simple system of elements that would reduce the potential for slope erosion by slowing precipitation runoff on slopes, enhance water infiltration, and encourage the restoration of natural vegetation. Permaculture design entails assembling landscape characteristics, a natural function, and appropriate organisms. With the permission of the Albuquerque Open Space Division, we prepared to recruit and train volunteers to treat approximately two acres of slopes in the Placitas Open Space. The slopes incorporated in the project have a pinion-juniper community on rocky or cobbly areas with poor soil development.

b. Beginning the project field work, December 5, 2015

The permaculture approach we selected to use has already been demonstrated in various situations by Jim Brooks of Soilutions Adaptive Terrain Systems. It can be done on a small scale, with hand tools, and with minimal training and demonstration. The execution of the techniques does not have to be exact for it to retain some degree of effectiveness.

The "treatment" Mr. Brooks imparted to our group of volunteers brings together:

- a landscape of slopes – not too steep;
- the penchant for water to run downhill;
- the ability of soil to absorb water run-off if it isn't moving too fast;
- an infusion of natural grass seed and mulch; and,
- a loose natural "screen" to bring nutrients to the seeds by attracting bugs, their predators (e.g., lizards, birds, etc.), and their natural processes.

The three main steps for creating berms on the slopes are as follows:

Swales and Berms. Hand shovels were used to create a series of berms running parallel to each other, each maintaining a single contour. The berm consisted of scooping out a shallow "swale", using the dirt to mound up small berm on the downhill side, and tamping down the berm somewhat to keep it in place when run-off or snow accumulates in the swale. This swale and berm structure needs to be kept on a single contour, to keep the water in place to soak in, rather than running downhill within the berm and escaping out the end.

c. Swale and berm being created, using a McLeod Tool.

A simple A-frame made of wood, with a small level attached to the cross beam, was used by the volunteers to create a row of small flags with which to guide the digging along the contour.

d. Volunteer using an A-frame with small level to mark contours for berms.

Sponge Pockets. About every 12 to 18 inches in the swale a narrow shovel was inserted about eight inches into the ground and levered to the side to create a pocket in the soil. Seen here is a sharp shooter shovel. Some mulch—in our case, straw—was put into this pocket and a handful of native grass seed sprinkled in it and along the swale, and a bit of soil sprinkled back over the pocket. It is better to use as the mulch something that rabbits aren't likely to eat. Moisture retained by the sponge pocket can facilitate the germination of the natural grass seed.

e. Placing straw and grass seed in a pocket made with the sharp shooter shovel.

Tree Branch Screen. Each of the bermed strips was then covered with a lightly interwoven layer of juniper branches with their needles. These were harvested from the lower boughs of juniper abundant in the area and trimmed into a shape to fit with the berm. These screens protect the sponge pockets, attract other organisms, and eventually disintegrate into the swales.

f. Placing juniper branches in swales after sponge pockets have been placed.

A series of parallel berms is intended to capture snow or slow and capture run-off from the top and sides of the slopes. Berms were not put in the steeper areas of the slopes where they are more likely to just wash out. In this way, the project succeeded in placing multiple berms on four slopes, thus constituting an erosion control treatment for a large area, including the slope area above where the berms have been placed, and between the berms. These are expected to slow runoff, capture and infuse water into the soil, encourage the growth and proliferation of natural vegetation, and reduce the amount of sediment washing off the hillsides into the drainage gullies that have gradually been gouged out by fast moving runoff.

g. First series of berms in progress on first slope treated in the project.

IV. GETTING THE WORK DONE

Work Team Recruitment. For this project we proposed to have the work in the field done by a group of volunteers. While some proposal reviewers were skeptical of this, we felt this would work in the Placitas area, which no longer has much in the way of agriculture as a means of livelihood. Beyond the Historic Village of Placitas, many of the residents in the newer developments are retirees. Many have demonstrated their interest and love of the area by engaging in hiking in BLM-managed areas of the watershed and landscaping their new gravelly yards with natural vegetation. They have become sensitive to the shortage of water, and to the look of the open spaces in drought years. They have seen torrents of sediment-filled water racing down the roads and arroyos near their houses. Before their

retirement many have been active in community life, are generally in good health, and now have time on their hands.

We recruited volunteers through the use of articles in the monthly Sandoval Signpost, a request on the local low-power FM radio station, and informational flyers posted on local bulletin boards for community activities in such places as the U.S. Post Office, the community library, the local grocery store and café, and the Placitas senior center. The response to these was good enough to produce a good turnout at the two informational workshops and a list of more than twelve adults who signed the list for volunteers. See Section VII below for more information on the successful use of volunteers.

Work Planning. Coronado Soil and Water Conservation District supervisors managed the project and engaged in every work session in the POS. We had indicated in our proposal the intent to engage as an instructional contractor and consultant Jim Brooks, a well-regarded permaculture advocate in Albuquerque. We initiated the project through a meeting with Mr. Brooks, with the purpose of settling on such project specifications as: the technique to be used in the field, the tools needed for this, the effective size of a work team, and what to include in the instruction and consultation he would provide to the volunteers.

h. CSWCD project team working with permaculture specialist Jim Brooks.

Initial Workshops. The instructional workshops were designed to have a morning classroom set up at the CSWCD office, a break for lunch, and then a demonstration of making the berms out in the Placitas Open Space in the afternoon. In order to provide some flexibility in the schedule, two identical workshops were held, one on a Wednesday and one on a Saturday, November 4 and 7, 2015, respectively. Nine persons attended the Wednesday morning session and 35 attended Saturday morning. About half of those attending on Saturday were interested in the information on permaculture landscaping for themselves, but did not intend to volunteer for the project work. We were pleased to see their interest in the topic for their own yards, which benefits the community in general.

For the morning session, Mr. Brooks described some of the principles of permaculture for landscaping and illustrated them with slides of various landscaping projects he had done or observed. Persons interested in volunteering for project work then convened near the work site and Mr. Brooks and his assistants demonstrated how to do the work. The Wednesday demonstration at the work site was truncated by sleet and thunder, but the

Saturday one was carried out as planned. For the Saturday session, the contingent of volunteers included eight teenagers from an Albuquerque charter high school, whose supervisors had heard about the project. Out in the field, they took up the activities with energy and interest in how to use the tools and create the berms. We had not attracted any other young people so were disappointed when it worked out that the program that sponsored their transportation did not allow travel outside of Bernalillo County, and they were unable to become longer term volunteers on this project. Recruitment of teenagers creates special challenges, but the effort should be considered.

Work Session Design and Schedule. We asked potential volunteers about a preferred schedule for the work sessions. Using this, we designed the work sessions to be scheduled for twice a month, or approximately every two weeks. Given that the work was being done during the winter months, we scheduled it for mid-day for the probability of the warmest hours and most sunshine. By observing how the volunteers responded to the work we found that the work sessions were generally about two hours. This varied to some extent, depending on the weather or coming to a good stopping point. In order to curtail the use of several cars on the small dirt roads in the area, to get to the work site within the POS boundary, volunteers were asked to park in an area for this purpose at the edge of the BLM land to the west of the POS. They then walked about 15 minutes both to and from the work site, usually as a group. To keep this from being too much of a chore, the rather large and heavy array of tools was transported to the edge of the work site by car, by the project leader.

i. A 15 minute walk takes the volunteers to the POS border and worksite.

Our Work Tools and Supplies. The project had budgeted for the purchase of tools that would be used exclusively for the project work. Mr. Brooks had provided guidance in the types of tools suited for the work. The Albuquerque Office of Open Space provided us with a box of mixed nature grass seed, collected from similar areas in the open space system.

We purchased the following tools, keeping in mind the need for multiples of each because of the expected work teams of ten or twelve people at a time. How to use each of the tools was demonstrated to the volunteers as needed, during the early stages of the project. After a few sessions it became evident that we also needed loppers and hand clippers to work more easily with the juniper branches. The project management team brought their own to loan to the volunteers. All tools were collected and counted at the end of each work session and stored by the project management team between sessions. These tools are now assets for the CSWCD, for future projects of this nature.

j. The various shovels, picks, and loppers purchased for the project work.

V. DID OUR SLOPE TREATMENT WORK?

The project techniques were selected and applied with the long-term goal in mind of reducing erosion. It is inherently difficult to estimate the prevention of some natural process, especially without extensive efforts to compare similar areas while controlling various variables. We did not plan for such controls. This simple permaculture approach is known to have various benefits to the natural environment so we sallied forth with a high level of optimism that keeping it simple would be important to going forth at all.

Perhaps notably, for all intents and purposes, precipitation events during the project months were generally scarce and scanty. Thus, opportunity for some degree of empirical evidence of whether the berms were slowing run-off was lacking. Some of the conditions we were able to observe during the project months are the following:

- After one rain storm that appeared to have enough volume to create some runoff, there was only some scattered evidence of small breaches of a few inches where the berm had let some through, which we repaired. More such repair probably would be in order when there is more precipitation. Passing hikers could even achieve this with their hands.

- Despite a lot of wind in the area, for months on end, the juniper layer in most areas had not been scattered out of the berms. We conclude that it is important to "weave" the branches over and under each other to at least a minimal extent, so they stay in place and continue their function of catching nutrients and maybe protecting to some extent early grass sprouts.

- We expected that there might be some evidence of the natural grasses from the sponge pockets sprouting at least by July. There is virtually no evidence of this, which may be due to the lack of precipitation—or to the proliferation of rabbits in this particular spring.

- After one snow event of less than an inch of snow, after a few days we observed that the berms and juniper layer held snow after the rest of the snow cover had melted.

k. Early January, 2016, POS work site berm holding snow.

Despite this near-term situation in the Las Huertas watershed, a landscaping permaculture method such as was used here has a capacity for sustained functioning, certainly for months, and maybe for years, if the restoration of the natural vegetation progresses due to greater moisture infiltration. Many of us will be checking our area from time to time

VI. TECHNICAL MEASUREMENT

Precipitation. We had also anticipated being able get some measurements of precipitation events in the general area, and of moisture in the soil above and within the swales. This is seen as important to be able to enhance the faith in the natural processes being depended on to warrant extended and continued efforts along these lines in the slopes of the Placitas Open Space.

For this purpose, we budgeted for two rain gauges and a device for measuring soil moisture. The ones we purchased included the capability to electronically record and save the individual measurements. For both types of devices, it would be most accurate to collect the measurements at the work site. However, the POS is accessible and well used for recreational hiking and riding so we did not want to leave any expensive equipment in the field. We set up the two rain gauges in private yards somewhat near our work site. They were self-emptying and made a daily recording that could be downloaded at our convenience. These gauges could give us at least some indication if there had been heavy precipitation in the general area—but of course depend on it actually raining. Neither of the gauges ever reported any day showing over 0.15 inches.

Soil Moisture. Some review of agricultural literature on measuring soil moisture and a perusal of on-line descriptions of several kinds suggested led us to a specific device that was described as being possible be treated as portable. Project staff engaged in a phone discussion with technical people with the supplier. From this we believed it would be possible to get at least a relative measure of moisture in the soil above a particular swale, and in the bottom of the swale. This would not in any sense be scientifically accurate, but would permit some degree of relational measure of moisture in paired locations, which is adequate for our purposes. The probe, attached to an electronic reader, could be used in multiple locations and across multiple times, with the data registered by the reader to be transferred to a computer. We were attempting to get a percent Volumetric Water Content (%VMC). The supplier advised us that we will need to reduce the amount of air around the probe, and to try to get some more accurate calibration for our soil mineral.

Along with the lack of precipitation or moisture during the project months, the other major problem was our general deficit in adequate technical expertise to use these devices. Even with much interchange with technical experts from the suppliers it was a struggle to get at the measurements before the end of the project. We regret that we did not make the necessary concerted effort to find among our volunteers someone with the expertise and interest to take on this function for a project. Again, these devices are now assets of the

CSWCD for future projects. And the treated area is still accessible to us for future monitoring of its effectiveness in capturing moisture.

VI. NEXT STEPS

One element of the project design was to have Mr. Brooks and his assistants re-visit the treated area after about 6 sessions, to give his appraisal of what had been done and to provide suggestions both for what to continue and what might be next steps. He indicated his admiration of what and how much the volunteers had accomplished. He demonstrated for the volunteers some other materials they might find useful for their own property. He hoped there might be some impetus locally for extending the activity further across the POS. He also suggested that as a next step, we could work on the drainages between the slopes to keep them from developing into major head cuts and deep gullies. He demonstrated for us a way to construct rock "plates" in what are already the evident low areas where water flows. This technique can be carried out by hand, with small hand tools, using rocks readily available on the hillsides. The berms already in place can then be extended over to these areas where the rock plating has been put in place.

l. Mr. Brooks demonstrating how and where to create rock plating in drainage.

VII. MEASURING VOLUNTEER SUCCESS

The second primary goal of the project design was to tap into local interest and energy among residents do the actual shovel work on a volunteer basis. This also represented a cost share element for the budget. We feel this aspect of the design can be judged as very successful and effective. A dedicated, energetic, and congenial group of mostly Placitas residents formed very quickly, from the first actual work session.

We designed around being able to recruit about 12 volunteers, and purchased the tools with an eye to field teams of from 10-12, including the presence of the three-member CSWCD project team at each session. Somewhat more than 12 people signed up at first, but some did not materialize once the work was scheduled. About nine of those who signed up became a solid and reliable work team, despite their busy lives and the winter weather conditions. Three others came occasionally and sometimes volunteers brought a visitor. Regarding the weather, it is our opinion that is much better to do this work during winter months, because that is an appropriate time to sow the grass seeds, and also many of us would be reluctant to walk and dig in the summer heat. The following Table A reports the number of people reporting for the work sessions.

Table A. Size of Work Teams by Date

Work Session Date	Size of work team: No. of Volunteers	No. of CSWCD staff Included in total
Dec. 5, 2015	11	3
Dec. 12, 2015	10	3
Dec. 19, 2015	9	3
Jan. 9, 2016	7	3
Jan. 16, 2016	13	3
Jan. 23, 2016	10	3
Feb. 13, 2016	6	3
Feb. 26, 2016	13	3
Mar. 5, 2016	11	3
Mar. 26, 2016	6	3
Apr. 9, 2016	9	3
Apr. 23, 2016	4*, #	3

*The date of the mid-project assessment of the work from Jim Brooks had to be changed several times due to an unexpected illness and his full schedule. Whether or not there would be a session on February 13 had become confusing. Jim Brooks rescheduled for April 23rd, but regrettably many of the volunteers were taken up with complications of spring vacation with their relatives and visitors.
Reporter from the Signpost monthly newspaper also attended to view the work.

For the purpose of measuring volunteers' opinions on their experience with the work, the project management team developed a set of questions for obtaining responses from the volunteers about various elements of the project design such as scheduling, communication, guidance, and project management.

Their responses gave a strong indication that the organizational aspects—scheduling of the work, communication with volunteers, and their ability to perform the primary tasks—were considered in a positive light by our volunteers. Most were between the ages of 55 and 75, and were retired. They were highly motivated by a variety of benefits they saw from participating in the project. These included being outside, getting exercise, giving back, improving the environment, and the social aspects of being part of a team. Of the seven volunteers who responded to the questions, six said they would like to be contacted in the event of a future project, while one had to decline due to physical reasons.

We also asked for their opinion about improvements in management we should consider in similar future projects. Some said they would have liked to have a better idea of just what we wanted to accomplish in the time frame. They wanted some indication that they had "completed" what was expected. The other aspect most likely to be mentioned in discussions with them revolved around what is the appropriate amount of direction and oversight for a group of motivated adult volunteers. Some said they liked the generally loose organization of the work for each session, so they could pick and choose what they wanted to do that day. Others said they felt at a loss for just what they should be doing at a particular session and would have liked more specific direction for what was going to happen in that session. Certainly, it is the responsibility of the project management team to detect these preferences and try to ensure that individual volunteers get what they need in order to have a positive—and long term—experience.

m. The team of volunteers for erosion control work, December 2015 – April 2016.

Project Details

Carried out by:
Coronado Soil and Water Conservation District (CSWCD)
See web site: www.coronadoswcd.org/

Team:

Project Leader	Lynn Montgomery, Chair, CSWCD
Project Administrator and Volunteer	Carol Kennedy, CSWCD Administrator
Project Manager	Patricia Bolton, PhD., CSWCD Supervisor
Project Photographer	Zane (Cosmos) Dohner, Volunteer

Contractor:
Project Subject Matter Expert and Instructor (contracted):
Jim Brooks, Owner,
Soilutions—Advanced Terrain Systems,
Albuquerque, NM
See web site: http://soilutions.net/brooks-terrain-systems/

Devices:

Rain Gauges: ITWorks: Automatic Logging Rain Gauge

Soil Moisture Device: Decagon Devices: GS1 Water Content Sensor,
with ProCheck Sensor Read Out