Ponil Creek Restoration Project
Final Report

(With Final Financial Numbers)

RFP: FY08-SWQB/NPS-001

NMED Contract Number: 09-667-5000-0014

DFA Vendor Number: 0000009341

Date: May 10, 2013

1. Executive Summary

Define NPS problems being addressed:

Ponil Creek is located in northeastern New Mexico within the Canadian River drainage. The creek is formed by three main tributaries which are the North Ponil, Middle Ponil, and South Ponil Creeks. Each main tributary starts at an elevation above 11,000 feet and Ponil Creek ends at an elevation of 6,200 feet at its confluence with the Cimarron River. The aquatic habitat ranges from high mountain plunge pools with extremely high gradient to large meandering pools with gradient less than 1%. Ponil Creek flows through federal, state, and private land ownership.

At the start of this project, the Ponil, including Middle and North Ponil Creek, and the main stem from the Cimarron River was listed as impaired under section 303(d) of the Clean Water Act. The Ponil was not supporting high quality coldwater aquatic life with sedimentation/siltation, turbidity, and temperature as the probable causes of impairment. The primary purpose of the project was to address temperature impairment on the Middle Ponil from the Greenwood Creek confluence to the North Ponil confluence (12 digit HUC Codes 110800020202 and 110800020204). However, restoration treatments were also intended to reduce sediment and decrease turbidity within the creek, sediment is a listed impairment downstream on Ponil Creek.

Water Quality Goals and Objectives:

The goal of the Ponil Creek Restoration Project was to work towards removal of the Ponil from the list of impaired waterways. This goal was to be accomplished by lowering the stream temperature through restoration of riparian forests, stream bank stabilization, and erosion control treatments. The four main components of the project were:

- Restore 11 miles of riparian forest by planting native cottonwood and willow trees and to provide shade
- Reduce erosion and sediment at three low-water crossings through upgrades and improvements to the crossings
- Repair two cut-banks that are threatening to undermine the road along the Ponil (NM 204) and one large head-cut in the main channel that contributes to the stream's increased velocity
- Stabilize stream banks, increase sinuosity, and restore riparian areas along four miles of the Middle Ponil Creek in the Elliot Barker State Wildlife area

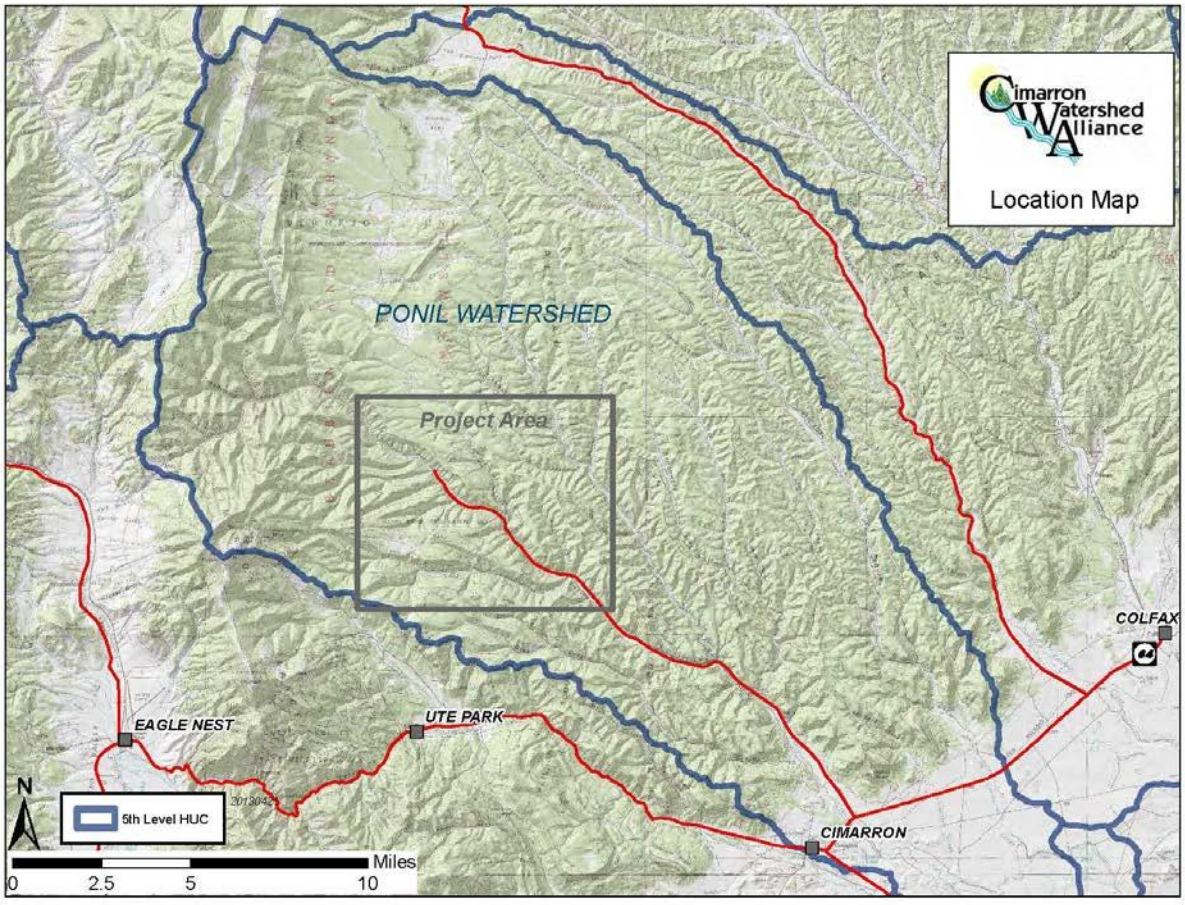
These treatments were designed to lower the stream temperature by increasing the amount of effective shade, reducing heat-trapping sediment, and reducing the width-to-depth ratio.

For canopy coverage, the original objective was to increase the canopy coverage for Ponil Creek from the original estimate of 25% to a desired level of 57%. This objective was designed to help move the one-time temperature maximum from the recorded 25.5° C to at or below the NMED Temperature Protocol for a one-time maximum of 23.0° C.

Original Timeframe:

Originally the project was supposed to end in September of 2011. The CWA requested two extensions, through May 10, 2013, partly to complete work on Low Water Crossing #3, but primarily to fulfill and expand the scope for Task 5 – "Barker Wildlife Area Restoration Sub-Project". The original scope for Task 5 included conducting a workshop, being a "bridge" to leverage additional restoration activities, and complete analysis and design for future projects. The CWA was able to fulfill this scope of work for this Task by conducting the Ponil Workshop in August of 2011, completing a stream assessment on 3.6 miles of the North Ponil and 5.5 miles of the Middle Ponil in 2012, leveraging the Elliot Barker Low Water Crossing Project (a project completed by New Mexico Game and Fish in 2011), and a preparing a restoration plan, completed in April of 2013, for the Bonita - Ponil Confluence Restoration Project on the Barker Wildlife Management Area (Barker WMA).

Project Location Map (Figure One)



Cooperators Involved:

This project was implemented by the Cimarron Watershed Alliance through a collaborative process with Philmont Scout Ranch, Vermejo Park Ranch, the Chase Ranch, the CS Ranch, the Quivira Coalition, the Village of Cimarron, New Mexico State Forestry, New Mexico Environment Department's Surface Water Quality Bureau, and New Mexico Department of Game and Fish.

Funding (Federal and State):

In the final analysis, the CWA expended $214,441.7 on the Ponil Creek Restoration Project; $127,312.7 (59.4%) was Federal 319 Funding and $87,129.00 (40.6%) was match. Below is a summary of the final accounting:

Final Accounting			
Federal	**Work Plan Budget**	**Expenditures**	**Remaining**
Personnel/Labor	$46,080.00	$40,175.20	$5,904.80
Equipment	$3,010.00	$5,254.11	($2,244.11)
Travel	$6,912.00	$1,607.70	$5,304.30
Supplies	$55,200.00	$26,609.45	$28,590.55
Contractual	$12,000.00	$41,712.74	($29,712.74)
Other	$8,800.00	$11,953.50	($3,153.50)
Sub-Total	**132,002.00**	**$127,312.70**	**$4,689.3**
		59.4%	
Match Cash and In Kind	**Work Plan Budget**	**Expenditures**	**Remaining**
Personnel/Labor	$91,248.00	$74,340.00	$16,908.00
Equipment	$16,810.00	$4,304.90	$12,505.10
Travel	$6,912.00	$572.35	$6,339.65
Supplies	$6,700.00	$5,550.00	$1,150.00
Contractual	$0.00	$0.00	$0.00
Other	$1,600.00	$2,361.75	($761.75)
Sub-Total	**$123,270.00**	**$87,129.00**	**$36,141.00**
		40.6%	
TOTALS	**$255,272.00**	**$214,441.70**	**$40,830.30**

In 2012 the CWA, in consultation with NMED, requested an extension and revised budget for this Grant, to expand Task 5 to include a reconnaissance assessment on of a larger reach of the Middle Ponil and a reach on the North Ponil. The revised budget included the additional Contractual costs reflected in this final budget, which were approved by NMED. Additionally Task 5 called on the CWA to consider the Ponil Creek Restoration Project as a "bridge to further grants and restoration on the Ponil". As referenced in the narrative below NMGF did complete a leveraged project on the Barker WMA that upgraded an additional 3 low-water crossings utilizing the work on the Ponil Creek Restoration Project as impetus and as an example. This NMGF project cost in excess of $50,000, unfortunately the CWA was not able to use the project cost as match because a portion of the project was funded with Federal funds. If the CWA had been able to capture the NMGF project as match it would have met its planned match. The CWA did meet the required 60:40 match required by the grant.

2. Project Description and Chronology

Introduction:

As mentioned above, Ponil Creek (8 digit HUC Code 11080002) is located in northeastern New Mexico within the Canadian River drainage and is comprised of three main tributaries, the North, Middle, and South Ponil Creeks. Each main tributary starts at an elevation above 11,000 feet and Ponil Creek ends at an elevation of 6,200 feet at its confluence with the Cimarron River. The aquatic habitat ranges from high mountain plunge pools with extremely high gradient to large meandering pools with gradient less than 1%.

The Ponil Creek flows through federal, state, and private land ownership. Land owners in the project area include Vermejo Park Ranch, Philmont Scout Ranch, and New Mexico Game and Fish (Barker Wildlife Management Area). Also, the Valle Vidal Unit of the Carson National Forest is adjacent to parts of the project area. As such, land use includes recreation and agriculture within the project area. Recreation uses include hunting, fishing, backpacking, and camping. Agriculture uses are mostly livestock grazing with some occasional timber utilization.

Historical and recent management practices as well as an unfortunate natural disaster within the Ponil watershed have impaired its ability to function as a healthy aquatic ecosystem. Six specific contributors include:

1) Historical overgrazing of livestock within the riparian area;
2) Straightening and down-cutting of the stream channel caused by erosion from the railroad bed of the Cimarron North West Rail Road built in 1905;
3) A large wildland fire in the headwaters (Ponil Complex 2002) which caused floods that further destabilized sections of the stream bank;
4) Current and historical browsing of riparian vegetation by elk;
5) Erosion from numerous low-water crossings; and
6) Introduction of certain noxious weed species along its banks.

All of these occurrences have contributed to the impaired condition of the Ponil. The over-grazing and over-browsing, in conjunction with impacts from the 2002 fire, have reduced the riparian tree canopy, and the amount of effective shade which has led to increased stream temperatures. The stream bank modification and destabilization also increased the temperature by reducing sinuosity which allowed a wider and shallower channel to develop. Additionally, the sedimentation and turbidity from stream crossings and upland sites with erosion problems have increased the mass loading within the creek which also increases temperature. The end result has been the inability of the Ponil to support high quality aquatic life.

Project Tasks:

Task 0 – Complete Work Plan and Professional Services Contract between State of New Mexico and Cimarron Watershed Alliance for 319 Project
Task 1 – Develop Monitoring QAPP
Task 2 – Cottonwood restoration sub-project
Task 3 – Low water crossings sub-project
Task 4 – High priority stabilization sub-projects
Task 5 – Barker Wildlife Area Restoration sub-project
Task 6 – Reports

Best Management Practices Implemented:

Task 1: Monitoring

Original Scope from Work Plan:

In the interest of data consistency and compatibility, this project will adopt the same monitoring procedures utilized by the NMED/SWQB. Given the relatively nontechnical, non-rigorous nature of the methods chosen, we are confident in our ability to achieve the same data quality objectives and quality assurance standards. The Ponil Working Group of the Cimarron Watershed Alliance (CWA) will work with the New Mexico Environmental Department to develop the monitoring framework from the CWA's Ponil 319 proposal, shown below, into standard operating procedures for the project.

BMP's Implemented:

The CWA adopted the monitoring protocols of NMED. NMED staff assisted the CWA with monitoring throughout the project, to include locating and documenting photo points, establishing cross sections, conducting shade density measurements, and deploying temperature monitors. Overall monitoring was successful and achieved the objectives of the project, but as with many projects, data management could have been improved and some data is missing. All the available data is tabulated in Appendix A.

Task 2: Cottonwood Restoration

Original Scope from Work Plan:

A primary component of the Ponil Creek Restoration Project was to plant and protect native cottonwoods along 11 miles of the Ponil Creek on Vermejo Park Ranch, Philmont Scout Ranch, and the

Elliot Barker State Wildlife Management Area (Barker WMA). Restoring the riparian canopy cover would increase the amount of effective shade along the Ponil and lower stream temperatures. A community involvement / education and outreach element would enlist school children to assist with planting efforts along a reach near town. The project would also utilize Boy Scouts to assist with planting efforts in areas within the Philmont Scout Ranch.

BMP's Implemented:

In total, 9 full-sized exclosures have been built along the Middle Ponil as part of this project. The vegetation inside the exclosures is generally doing well. The vegetation inside the older exclosures is predictably more successful than the vegetation inside the newer exclosures due in large part to the severe drought in 2011 and 2012.

Also, 21 cottonwood poles were planted with mini-exclosures around each one. This does not include cottonwood plantings that were part of restoration treatments at the Low Water Crossings, Cut Banks, or the Head-Cut. The cottonwood pole plantings are doing better than expected, given the severe drought conditions in the area since they were planted. Many of them did not survive, most likely due to the record drought, but the survival rate was about 25%, which is better than we expected. In the spring of 2013, the CWA replanted fifteen of these cottonwoods that did not survive due to the drought and rebuilt the mini-exclosures around the plantings.

2013 Cottonwood Planting 1 – Alan Huerta and Julia Stafford

Task 2 posed a perplexing challenge for the CWA and NMED. Based on the 2001 TMDL for Middle Ponil Creek, the existing total shade for the upper section of this reach was reported to be 26% (25% topographic shade and 1% vegetation shade) and the Current Field Condition for the solar radiation component per 24 hours is 210 joules/meter^2/second (j/m^2/s). The Target Load Allocation for this reach is 120.4 j/m^2/s, which would be achieved by increasing the total shade to 57%. This means that the vegetation shade (canopy coverage) would have to increase from 1% to 32%. These values are based on field data collected by SWQB and SSTEMP Modeling results for this reach.

Monitoring data that was collected as part of this project shows that the measured canopy coverage along this reach of the Middle Ponil was 51% in 2009 and 54% in 2012, much higher than would be expected given the temperature impairment and the 2001 TMDL canopy coverage numbers. Yet, temperature monitoring results indicate that stream temperature in the Middle Ponil continues to exceed the standard for the designated use of supporting high quality cold water aquatic life. Field observations of the riparian vegetation along the Middle Ponil Creek show that the canopy is comprised of mostly willows and young riparian trees such as alders and cottonwoods that have naturally regenerated since the riparian area burned during the 2002 Ponil Complex Fire. But, the riparian area

lacks an overstory of taller, more mature riparian trees because most of the older trees burned during the 2002 fire. The conclusion is that riparian overstory clearly plays a major role in lower the stream temperatures on Ponil Creek.

So, the CWA modified its original plans for this Task based on the canopy measurements and tried to focus on areas with less canopy coverage. Given the continued temperature impairment for this reach and based on the CWA's stream temperature data, exclosures and cottonwood plantings are still needed. Site selection for additional exclosures and cottonwood plantings should be based on careful assessment and additional canopy measurements. It will be several more years before the new trees reach full height and the riparian overstory becomes reestablished. Refer to Appendix A for a summary of the canopy density monitoring and the locations of the exclosures and cottonwood plantings.

Planned and Actual Milestones, Products, and Completion Dates:

The Work Plan called for this Task to be ongoing throughout the lifetime of the project, which was originally from 2009 to 2011. This Task did indeed continue throughout the life of the project, with exclosure construction and cottonwood plantings beginning in 2009 and continuing through the spring of 2013. Implementation of this Task benefited from the lessons learned and the knowledge that was gained as the project progressed. This Task originally called for cottonwood planting and exclosure construction along 11 miles of the Middle Ponil Creek. Overall, 9 exclosures were constructed and 21 cottonwoods were planted. This Task was not implemented according to the original project scope because the canopy coverage was much higher than expected.

Measures of Success:

Task 2 was not implemented according to the original scope of work, but as mentioned above, this was due to challenges that arose when the CWA and NMED realized that the canopy coverage along the Ponil was in fact much higher than anticipated. Based on the actual canopy coverage numbers, the CWA modified its original plans for this Task and focused on area with less coverage. So, the goals of Task 2 were met, just not to the scope that was originally set. In total, 9 full size exclosures were constructed and 21 cottonwoods were planted as part of this Task.

The official canopy monitoring data shows that the canopy coverage, as measured at randomly selected sites, increased from 51% in 2009 to 54% in 2012. This increase of 3% is much lower than the original goal of the project which was to "increase effective shade by 15-25% along 11 miles of stream". However as noted above, the CWA's monitoring shows that the actual canopy density was much higher than reported in the TMDL and a 15-25% increase may not have been practical. Overall given the drought conditions a 3% increase is a success. A few of the canopy coverage data points are located in the middle of new beaver ponds, so the canopy coverage values for these sites decreased dramatically from 2009 to 2012.

In addition, canopy coverage monitoring numbers can be significantly influenced by stream flow. The stream flow in 2009 was relatively normal, so the 2009 numbers should be a fair representation of the actual conditions. However, 2012 was one of the driest years on record in the Ponil Watershed. In 2012, the USGS Gage on the Ponil Creek (USGS Gage Site 07207500) recorded 197 consecutive days of

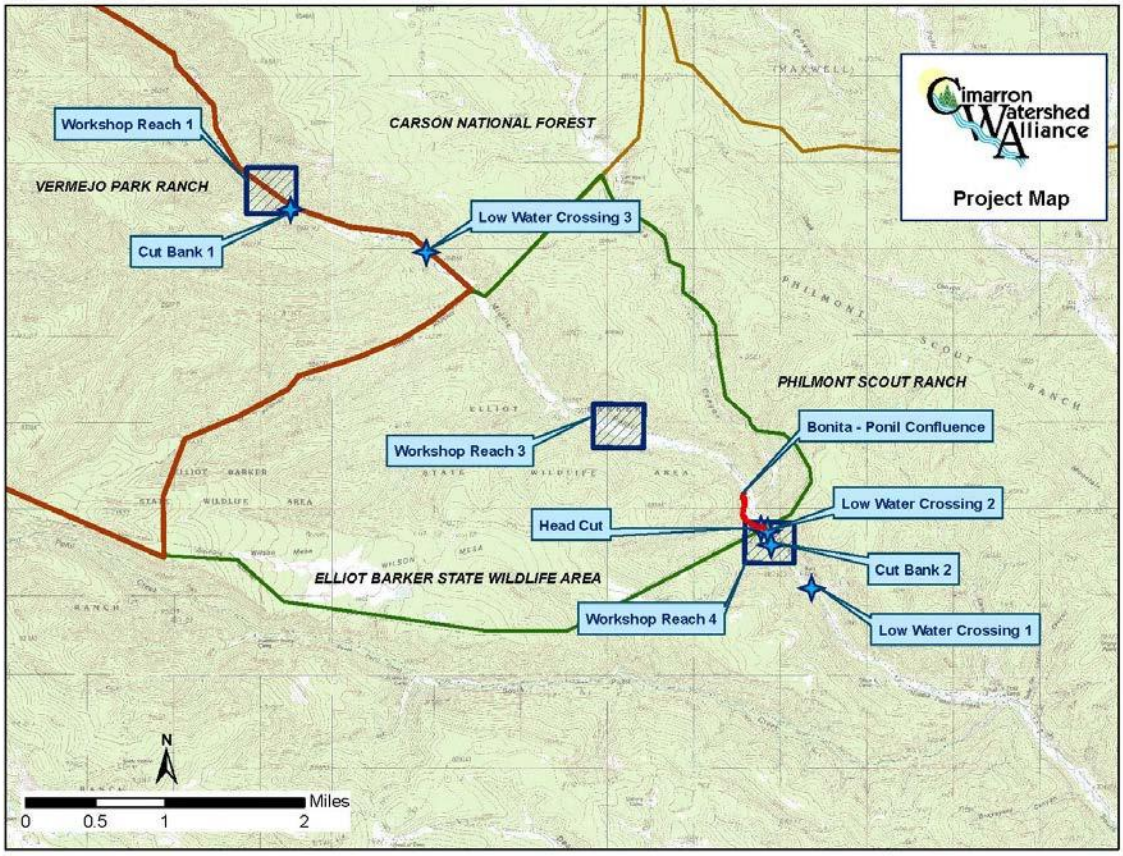
zero-flow on the Ponil the most in the entire period of record (1916 to 1928 and 1951 to Present). Low flows make the active stream channel much narrower, so in order to follow protocol canopy coverage measurements must be made much closer to the center of the stream. Taking these measurements closer to the center of the stream leads to lower canopy coverage values. Without the skew introduced in 2012 by these beaver pond sites and by the low flows, the CWA estimates that the overall canopy coverage most likely saw an increase of 6% to 10% from 2009 to 2012.

Task 3: Low Water Crossings

Original scope from Work Plan:

This project component will reduce erosion and reduce the width-to-depth ratio at three low water crossings through upgrades and improvements. Assessments have been conducted to determine the most appropriate structures to improve stream crossings. Structures and improvements selected will allow passage of all aquatic species, particularly fish, by maintaining swimmable low-flow depths. They will maintain natural streambed substrate material, roughness, slope, and form through all or part of the structure, and will not confine or narrow bankfull flows, nor increase the natural stream channel velocity. Furthermore, upgrades will accommodate major flood flows without significant drops in the water surface profile and provide areas of diverse flow velocity and depth.

Figure 2 Project Map



BMP's Implemented:

Low Water Crossing #1 is 1.7 miles upstream from Philmont's Ponil Camp and confluence of the South and Middle Ponil (see Figure Two – Project Map). Originally this crossing was over fifty feet wide and very deep. The crossing was moved upstream and a cross vane was constructed below the crossing to restore the proper width-to-depth ratio. The road surface was armored with cobble to reduce sedimentation and erosion from vehicles. Where the old crossing was overly wide, rocks were used to reestablish the bankfull bench at the proper height and width, and fill material was added behind the rocks to fill the hole created by the old crossing. The bankfull bench was planted with grass and cottonwoods, and an exclosure was built to prevent grazing. Rolling water bars were installed on the road leading into the crossing to reduce erosion from the road into Ponil Creek. Where the original crossing had been through a wide deep muddy pool, the new crossing is at a narrow, cobble lined, narrow riffle (see Appendix A, Photo Point 5).

2011 – Philmont Conservation Crew installing post vanes Low-Water Crossing #3

Low Water Crossing #2 is 0.1 miles downstream of the boundary between Philmont Scout Ranch and the Elliot Baker Wildlife Area. Restoration of this crossing was similar to Low Water Crossing #1; a cross-vane was constructed below the crossing to narrow the crossing, the road was resurfaced with cobble to reduce sedimentation, rolling water bars were built on the road to reduce erosion from the road from reaching the creek, and willows were planted.

Low Water Crossing #3 is 0.2 miles upstream from the Elliot Barker Wildlife Area on Vermejo Park Ranch. The instability at Low Water Crossing #3 consisted of an overly wide crossing and an actively eroding cut bank on river left. To reduce the width to depth ratio and relieve some of the near bank stress, in 2012 a series of post vanes were installed along the river left cut bank above and below the crossing, and this area was planted with willows. In 2013, a bankfull bench was excavated behind the post vanes to further reduce the near bank stress. Rolling water bars were constructed on the uphill approach to the crossing to reduce sedimentation from the road. Refer to Appendix A for photo documentation of the low-water crossings.

Planned and Actual Milestones, Products, and Completion Dates:

The Work Plan called for Low Water Crossing #2 and #3 to be completed in 2009 and Low Water Crossing #1 to be completed in 2010. Low Water Crossing #2 was completed in October of 2009 and Low Water Crossing #1 was completed in 2010. Restoration of Low Water Crossing #3 started in 2012 and was completed in 2013. Originally, work on Low Water Crossing #3 had been planned to correspond with Low Water Crossing #2 but was delayed in order to correspond with other volunteer activities.

Measures of Success:

The goals of Task 3 were achieved completely. Low Water Crossings 1 and 2 were successfully restored according to the original plans, and Low Water Crossing 3 was restored successfully after making a slight modification to the original plan. Photo monitoring of these three sites shows that the treatments were implemented successfully and that these sites have been stabilized. As such, these Low Water Crossings are no longer contributing major amounts of sediment into the stream. The photos also show that the width-to-depth ratio of the stream at these sites has been decreased dramatically and that the riparian vegetation near these sites is starting to recover. Both of these factors significantly decrease the solar loading on the creek and will help to reduce stream temperatures.

Task 4: High Priority Stabilization

Original scope from Work Plan:

This component of the project will fix one recent and very active head-cut in the stream itself and fix two cut-banks alongside the road. These three sites were identified during an assessment conducted in March of 2008. The head-cut formed because debris from the Ponil fire had blocked enough of the main channel to allow the creek to cut off a meander and form a new channel. Unfortunately, the new channel is now a 6 foot tall head-cut that is causing the stream's velocity to increase leading to downstream incising (which has already removed ~ 350 cubic yards of material), erosion, and destabilization of the Ponil's banks. Two large cut-banks were identified as high priority treatment areas due their size and potential impact to the Ponil Road.

2009 – Rangeland Hands, Inc. Installing Log Vane

BMP's Implemented:

Restoration of the Head-Cut was competed in 2009. Restoration consisted of placing a large boulder baffle to deflect water back into the original channel and away from the Head-Cut that threatened to cause a cut-off meander. A series of log vanes were placed in the original channel to assist with stability of the original channel. A second cross section was established in 2011 just downstream from the Head-Cut and bolder baffle in a location that appears to be down cutting slightly. No down cutting was apparent from the re-survey of the cross section in 2012. This cross section will continue to be monitored annually to assess stability of the channel. Please refer to Appendix A for pictures of the Head-Cut restoration (Photo Point 3a) and Appendix A for a schematic of the Head-Cut restoration showing the two cross section locations and cross section data.

Restoration of Cut-Bank 2 was completed in 2009. A series of rock vanes were installed to roll the thalweg away from the Cut-Bank and thereby reduce the near bank stress. The boulder vanes were

later planted with willows to help establish vegetation along the outside bend of the meander. Please refer to Appendix A for pictures of the restoration.

The original design for Cut Bank 1 was a series of post vanes. The vanes were constructed in the summer of 2011. Based on observations at the site it was decided that an additional vane would be required at the downstream end of the cut-bank. The CWA in consultation with the Philmont Conservation Department determined that a post bankfull bench would be better suited for the application. The post bankfull bench was completed in the fall of 2011 and has been operating as designed for the last year. Please refer to pictures in Appendix A of Cut-Bank 1 and the post bankfull bench. The original photo point (Photo Point #1) is now obscured by vegetation. A second photo was taken to show the post bankfull bench. Please note from the photo that some "well intentioned" person(s) has filled a small erosion channel with rock which has disrupted the function of the post bankfull bench. This material will be removed in the summer of 2013 by the CWA.

Refer to Appendix A for an as-built drawing of the head-cut restoration. The restoration of the cut-banks and the head-cut were documented with photo points. Cross sections are available for the head-cut restoration.

Planned and Actual Milestones, Products, and Completion Dates:

Given the potential for the head-cut to migrate upstream, the Work Plan called for completion of work on the Head-Cut and Cut-Bank #2 in 2009. Both were completed in the time frame set forth in the Work Plan. Restoration of Cut-Bank #1 was supposed to start in 2010 but wasn't completed until 2011. The CWA has outstanding volunteer support, so delays in completion dates and milestones usually centered on coordinating volunteer efforts.

Measures of Success:

The goals of Task 4 were achieved completely. The Head Cut and Cut Bank 2 were successfully restored according to the original plans, and Cut Bank 1 was restored successfully after making a slight modification to the original plan. Photo monitoring of these three sites shows that the treatments were implemented successfully and that these sites are recovering. It is clear from the photos that the Head Cut and Cut Banks are no longer eroding or contributing major amounts of sediment into the stream. The photos of these sites also show that the riparian vegetation has dramatically increased and the width-to-depth ratio of the stream has decreased; these two factors increase the total shade on the creek and decrease solar loading and stream temperatures. Also, a stream channel cross section was established at the Head Cut. This cross section shows that the Head Cut has been bypassed and that the reestablished stream channel has stabilized in its current location.

Task 5: Barker Wildlife Area Restoration

Original scope from Work Plan:

Restoration work will take place along 0.5 miles of the Middle Ponil Creek in the Elliot Barker Wildlife Management Area (Barker WMA). The goal of this component is to stabilize stream banks, increase sinuosity, and restore riparian areas in order to decrease the width-to-depth ratio and lower stream temperatures. Restoring the riparian canopy cover will increase the amount of effective shade along the

Ponil and will lower stream temperature. This sub-project will be both a restoration project and workshop for riparian systems and minimal impact restoration. The CWA will be pursuing additional matching funds to augment this project.

The scope of work for Task 5 included analysis and restoration design for a 0.5 mile reach on the Barker WMA, hosting a workshop focused on riparian restoration, and identifying leverage opportunities for future grants and restoration on Ponil Creek. In consultation with NMED, the scope of Task 5 was expanded to include reconnaissance assessment of a larger reach on the Middle Ponil and also a reach on the North Ponil.

BMP's Implemented:

Ponil Monitoring Workshop – The CWA hosted the Ponil Monitoring Workshop on August 24-26, 2011. The Workshop focused on proper monitoring techniques for a riparian restoration project including proper techniques for photo points and Rosgen Level II Morphological Description. A Rosgen Level II Morphological Description includes establishing a cross section, longitudinal profile, pebble count, and meander geometry to determine stream classification and velocity / discharge estimates. Eighteen people attended the Workshop and conducted field work on three reaches of the Middle Ponil. A summary of the data collected during the Workshop is included in Appendix A with the cross section information.

2011 Ponil Workshop – Surveying Cross Section

Middle and North Ponil Creek Assessments - This assessment of 3.6 miles of the North Ponil and 5.5 miles of the Middle Ponil was conducted by Rangeland Hands in the spring of 2012 in partnership with CWA volunteers, the Philmont Conservation Department, and the New Mexico Department of Game and Fish. It sought to estimate the annual sediment contribution into the stream from unstable banks, to identify other probable sources of sediment contribution to the stream, and to identify other issues within the watershed that should be addressed. The complete report can be found in (Appendix D). Based on the EPA approved method for estimating annual sediment contributions into streams from stream banks, the sediment contribution from unstable stream banks along these reaches has been estimated as:

- 5,394 tons of sediment per year from unstable banks along a 3.6 mile reach of the North Ponil on Philmont Scout Ranch.
- 7,068 tons of sediment per year from unstable banks along a 5.5 mile reach of the Middle Ponil on the Barker WMA and Philmont Scout Ranch.

Bonita / Ponil Confluence Restoration Plan – The Bonita-Ponil Confluence was identified as a priority for restoration based on the assessment of the Middle and North Ponil Creeks. Historically, Ponil Creek has been impacted by overgrazing, poor road construction and maintenance, a railroad spur in the North Ponil, and removal of beavers. More recently, the 2002 Ponil Complex Fire exacerbated issues on the Ponil causing increased sedimentation and loss of cottonwoods and willows from the fire. Bonita Creek was heavily impacted by the Ponil Complex Fire and introduced significant amounts of sediment into Ponil Creek. The complete restoration plan is included in Appendix C.

Four specific issues have been identified at the Bonita-Ponil Confluence:

1) the Bonita alluvial fan has been channelized purposely or naturally;
2) Bonita Creek has deposited a sediment plug in Ponil Creek which has essentially dammed and widened the channel;
3) Below the sediment plug, the combination of the upstream sediment plug and a change in valley type has formed a potential head-cut; and
4) Upstream of the Bonita confluence Ponil Creek is slightly entrenched, has multiple cut-off meanders, and is actively down-cutting.

Elliot Barker WMA Low-Water Crossings – New Mexico Game and Fish upgraded the three low water crossings on Middle Ponil Creek on the Elliot Barker WMA in 2011. This project was a direct offshoot from the Ponil Restoration Project. NMGF used the same design for the crossings as the CWA utilized for Low-Water Crossings #1 and #2. Task 5 had a stated goal of being a "bridge" to further grants and restoration on Ponil Creek. The NMGF Elliot Barker Low Water Crossings project and Bonita - Ponil Confluence Restoration Project both met this objective.

Planned and actual Milestones, Products, and Completion Dates:

The original Work Plan called for Task 5 to be completed by August 2011. The Ponil Workshop met the objective of the original scope of Task 5 and was completed in this time frame. In consultation with NMED, the scope and time frame for Task 5 was expanded and extended to allow for time to complete additional tasks. The Final Performance Report for the NMGF Middle Ponil Creek Low-Water Crossing Project is attached as Appendix E.

Measures of Success:

Task 5 was very successful, especially since this success is based on an expansion of the original scope of work for this Task. The Ponil Monitoring Workshop was effective in that it not only met the goals of hosting a workshop on the Ponil Creek, but it also provided education and outreach to project partners, other NGO's, and the public in general. This Workshop also generated some vital monitoring data for the Ponil Project. The planning and preliminary design work that was completed for the Bonita - Ponil Restoration Project met the goal of providing analysis and design on a 0.5 mile reach of the Middle Ponil on the Barker WMA. In addition, the Bonita - Ponil Restoration Project, along with the Barker WMA Low Water Crossing project, achieved the goal of creating a "bridge" to additional projects along the Ponil. Task 5 was expanded to include the Assessment of a longer reach of the Middle Ponil as well as a reach of the North Ponil. This assessment was highly successful in that it estimated sediment contributions

into the stream, and it also provided the CWA with some valuable information for planning future projects.

Task 6: Reporting

The Work Plan for the Ponil Restoration Project included Quarterly and Final Reports. The Quarterly Reports were to highlight major accomplishments for the period, including achievement of performance targets or milestones, implementation of BMP's (miles or acres of area treated, structures installed etc.), and WRAS / WBP progress. The Final Report requirements have been followed here in this report.

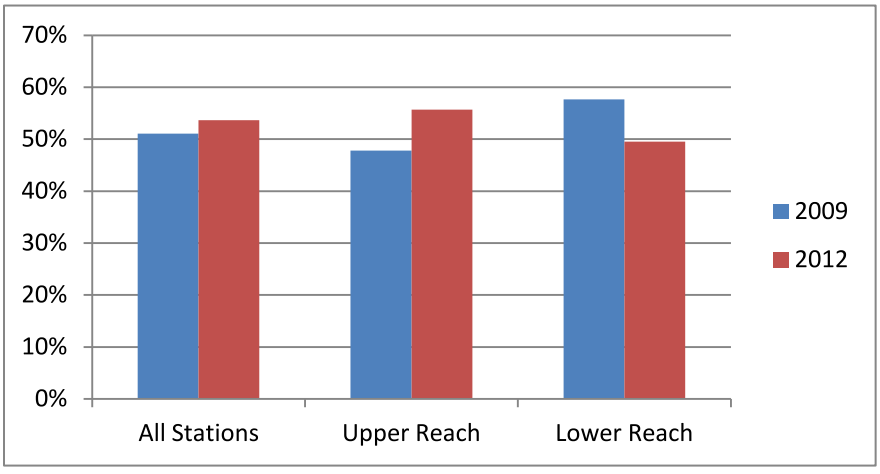
Planned and actual Milestones, Products, and Completion Dates:

Overall the CWA met the reporting requirements for the grant. However, a few quarterly reports were missed and on a few occasions NMED Grant contact, Chris Cudia, had to request a report. As has been mentioned above, the CWA is a small volunteer organization, so occasionally completion dates were missed. The CWA had good contact with NMED to discuss any delays and the majority of the time frames agreed to in the Work Plan were met.

Monitoring

The CWA adopted the monitoring protocols of the NMED. Four types of monitoring were called for in the approved Work Plan: 1) Riparian Canopy Density, 2) Cross Channel Profiles, 3) Water and Air Temperature, and 4) Photo Documentation. Two years of severe drought in the project area has impacted monitoring results. Mean cumulative flow on the Ponil is 8,298 acre feet per year based on the USGS Ponil Gage near Cimarron (7207500). The gage is on the main stem of Ponil Creek, below the confluence with the North Ponil. The gage is above any irrigation diversions. Cumulative flow at the gage was only 639 acre feet in 2011 (lowest flow on record) and 2,086 in 2012. The photo monitoring supports these numbers; it shows that the Ponil was dry in 2011 and 2012. The low flows impacted both the canopy density measurements and temperature measurements. Below is a summary of the monitoring results:

Riparian Canopy Density – Canopy measurements were taken at 30 randomly selected locations along Middle Ponil Creek. Overall the monitoring shows an increase in canopy from 51% to 54%.



However on the lower reach, the canopy density decreased from 58% to 50%. Based on field observations, most people that have worked on the project reported seeing an increase in canopy. The drop in the lower reach

measurements could be attributable to the drought conditions that have persisted in the project area since 2010.

Ten canopy measurements are taken at each location and then averaged for a score. Four measurements are taken in the middle of the stream and 3 measurements are taken 1 foot from the left edge of water and also the right edge of water. During times of very low flow and no flow, these measurements are taken closer to the middle of the channel and further from the vegetation. There was no flow in the lower reach when the measurements were taken in 2012. To mitigate these inconsistencies in data collection, the monitoring protocol for canopy measurements may need to be modified to account for low flow and no flow conditions.

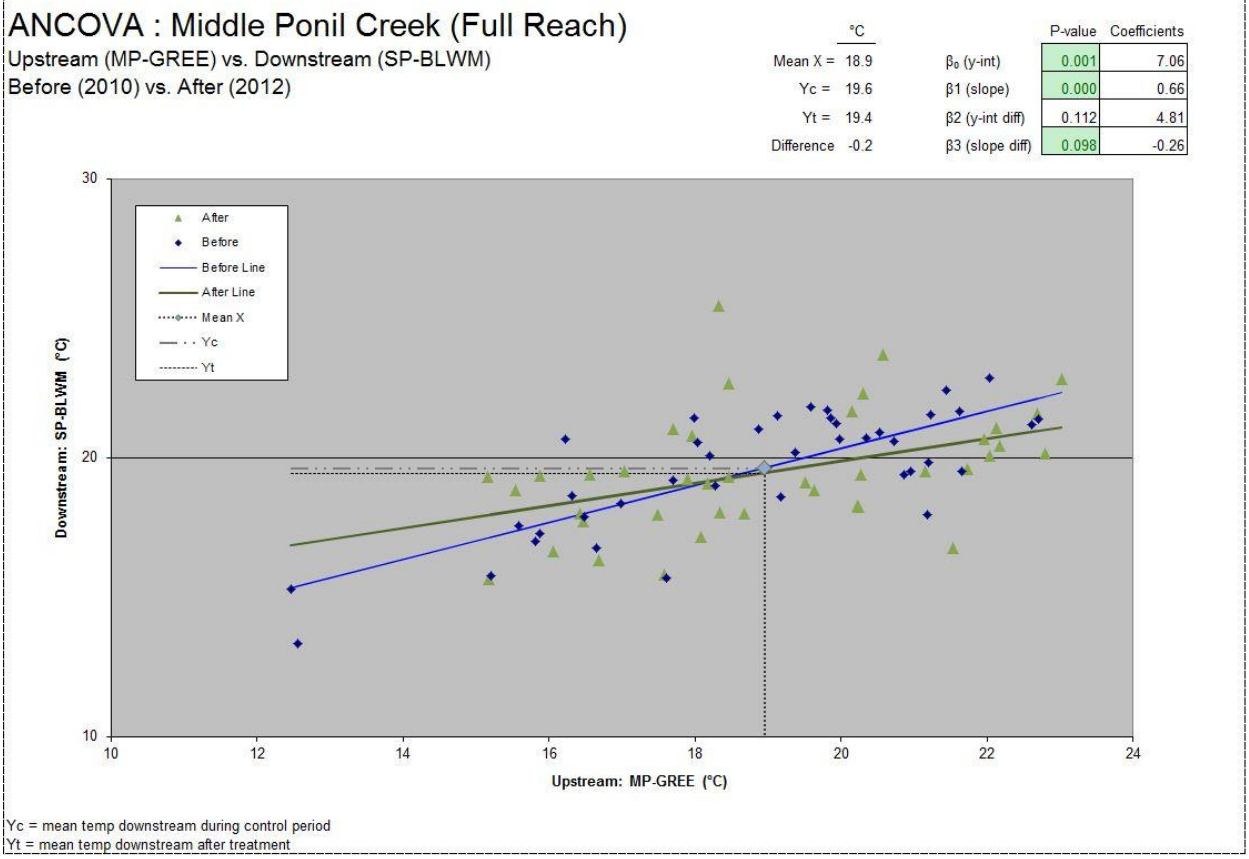
Cross Sections – Formal cross sections were established at the head-cut site and near the first exclosures that were built in 2010. In addition, 3 cross sections were established during the 2011 Ponil Workshop. The cross sections from the head-cut location and from the 2011 Ponil Workshop are included in Appendix A. The cross section data documents basic morphological conditions including bankfull area, bankfull width, width-to-depth ratio, and entrenchment ratio. The CWA has not been able to obtain the cross section data from the exclosure sites for inclusion in this final report, but it was reported to the CWA that this data showed a reduced width-to-depth ratio inside the exclosure. Certainly a lesson learned would be that formalized cross sections should have been established at each of the low-water crossing to document the significant reduction in width to depth ratio at those locations.

Water and Ambient Air Temperature - Water and ambient air temperature were monitored at the top of the project area at the confluence of Greenwood and Middle Ponil Creeks, towards the middle of the project reach proximal to the Rich Cabins, and at the lower end of the project near the confluence of Middle and South Ponil Creeks.

Dan Guevara at NMED has been assisting the CWA with monitoring on the Ponil Creek Restoration Project and has compiled and evaluated the temperature data, his summary of the data follows:

> The results of an analysis of covariance (ANCOVA) using the Upstream/Downstream Before/After study design (UDBA) indicate that there has been a slight reduction in daily maximum temperature in the full project reach after treatment (reference chart for full reach). The full reach extends from above Greenwood Creek downstream to Ponil Camp. The regression analysis indicates that a statistically significant difference in slope between the before and after lines exists at a 90% confidence level. The negative value of coefficient Beta3 indicates a decrease in slope, which means greater reductions at the higher temperature range. The mean difference over the entire range of temperatures is a reduction of 0.2°C.
>
> The same analysis for the upper reach (above Greenwood to Rich Cabins) resulted in a slightly lower mean temperature after treatment; however the difference was not statistically significant between before and after regression lines (upper reach chart). The Lower Reach (Rich Cabins to Ponil Camp) showed a slight increase in temperatures,

and it was statistically significant at the 95% confidence level. These results are likely due to the drought conditions during the 2012 post-treatment period. Further monitoring is recommended to better determine the effects of the project (Refer to Appendix A – Temperature).



Temperature Data from the Entire Reach
of the Ponil Creek Restoration Project
showing a slight reduction in temperature

The Middle Ponil continues to exceed the 20^0 C water quality standard for a high quality cold water fisheries. The CWA plans to continue to monitor temperature on the Ponil. The severe low flow conditions in 2011 and 2012 certainly impacted water temperatures, so the CWA plans to continue this monitoring to determine the effects of the drought on stream temperature. Unfortunately, the water entering the project reach already exceeds the water quality standard during the summer months. So in order to make additional progress towards delisting the temperature impairment for the Middle Ponil, the CWA will need to continue to focus on not only this project area but also on the USFS property upstream of the project area. The CWA has been in discussion with the USFS to engage them as a partner in the proposed Phase II of the Ponil Creek Restoration Project.

Photo Documentation – The CWA and NMED identified five photo documentation locations in 2009 for monitoring of the project. The five photo point documented the following: Photo Point 1 – Cut Bank #1, Photo Point 3a – Head Cut, Photo Point 3b – Low-Water Crossing #2, Photo Point #4 – Cut Bank #2, and Photo Point #5 – Low Water Crossing #5. Photo Point 2 was never utilized because it didn't document a project in the Ponil Restoration Project Work Plan. Overall, the photo points meet the goals and objectives of the project, even though Photo Point #1 later became obscured by vegetation and had to be moved. Unfortunately, it is difficult to discern the reduction in width-to-depth ratio at the low water crossings because there was not flow in 2011 and 2012.

Photo Point 3a - Head Cut, June 30, 2010 after restoration with

Ponil Creek returned to its original channel.

3. Lessons Learned

The Ponil Restoration Project was successful in large part due to the collaboration of the cooperators involved and the efforts of the lead contractor Rangeland Hands, Inc. Volunteers for the project came from the CWA, Philmont Scout Ranch, and Vermejo Park Ranch. In-Kind match support came from Philmont Scout Ranch and Vermejo Park Ranch who provided both materials and equipment to the project. The New Mexico Environment Department, New Mexico Department of Game and Fish, and

New Mexico State Forestry all provided critical technical support for the project. Rangeland Hands, Inc., the lead contractor on the project, provided expertise and worked in adverse conditions in 2009 to finish work on the head-cut, low water crossing #2, and cut-bank #2. The project could not have been successful without the team effort put forward by all the cooperators.

As mentioned before, if the project suffered it was because the CWA is a small volunteer organization and at times it was difficult for the key persons to have time to coordinate volunteer and contractor efforts. To address this issue, the CWA has been working to build capacity in the organization by involving more stakeholders, particularly with planning and coordinating. For the proposed Phase II of the Ponil Restoration Project, the CWA has proposed a Project Manager to be supported by two Assistant Project Managers to help facilitate planning, organization, implementation, and oversight.

The New Mexico Environment Department assisted the CWA with monitoring throughout the project and helped build technical expertise to the point where the CWA hosted a Monitoring Workshop in 2011 as part of this Project. To continue to be effective, the CWA will need to continue to stress effective monitoring and data management.

4. Technical Transfer

The road up the Middle Ponil provides public access to the Elliot Barker Wildlife Area and Valle Vidal Unit of the Carson National Forest. As such, much of the project is visible to the public and the CWA has been able to use this opportunity to tour multiple groups through the project area. NMGF has already used the CWA's low-water crossings as an example when they upgraded the water crossings on the Barker WMA (refer to Appendix I). Additionally, the CWA conducted a Monitoring Workshop in August 2011 to teach to basics of monitoring for stakeholders and other NGO's interested in stream restoration.

5. Feedback Loop

The monitoring support that NMED provided to the CWA on this project was critical for building monitoring expertise within the CWA and for completing the required monitoring for the Grant. NMED also provide effective oversight reviewing quarterly reports and billing reports for accuracy. Chris Cudia was the NMED grant liaison and was always available when the CWA had a question and attended several CWA meetings a year to review progress on the grant and to provide input.

The CWA is structuring our future projects slightly different based on lessons learned during this grant. The basic structure of each project will be as follows: year one, permitting and project planning; years two and three, implementation; and the final years will center on monitoring, evaluation, and final reporting.

6. Future Activity Recommendations

This Ponil Creek Restoration Project helped begin the Cimarron Watershed Alliance's (CWA) active involvement within the Ponil Watershed and has provided much needed support to the restoration efforts of the landowners within the watershed. The Ponil Project has also helped initiate numerous future projects, to include planning, assessment, and conceptual projects. These projects include:

Ponil Creek Restoration Project, Phase II - A proposal for this project was submitted in April of 2013 by the Cimarron Watershed Alliance in response to the NMED Request for Proposals for On-the-Ground Water Quality Improvement Projects, a program that utilizes CWA Sec 319 funds. This proposed project would also address the temperature impairment in Middle Ponil Creek and would be a continuation of this Ponil Creek Restoration Project that is outlined in this Final Report. This project would build upon the successes and lessons learned from the current Ponil Project in an effort to make further progress towards delisting the temperature impairment in this section of the Middle Ponil. Components of this proposed project include:

1) Riparian tree planting and exclosure construction;
2) Instream stabilization and restoration;
3) Low water crossing stabilization;
4) Abandoned road restoration;
5) Boundary fence replacement across the Middle Ponil valley bottom; and
6) An assessment of the Middle Ponil Creek from the Barker WMA to the Greenwood confluence.

If accepted, this project would utilize CWA Sec 319 funds. Matching funds would be in-kind match from project partners and the Cimarron Watershed Alliance. The proposal is included in Appendix B.

Bonita-Ponil Restoration Project - The confluence of Bonita Canyon and Middle Ponil Creek on the Barker WMA (owned by NMGF) was identified as a priority for restoration based on the assessment of the Middle and North Ponil Creeks. A brief background for this project is given in the section "BMP's Implemented, Task 5". This project is still in the preliminary design phase, but proposed treatments include:

1) Relocate the road across the Bonita Canyon alluvial fan and restore the natural functions of the alluvial fan;
2) Plant vegetation along the Middle Ponil below the Bonita Canyon confluence;
3) Install two instream grade control structures (cross vanes) in the Middle Ponil below the Bonita Canyon confluence to help stabilize a grade transition and prevent a forming instream headcut;
4) Realign a 1/4 mile section of the Middle Ponil above the Bonita confluence to restore an entrenched, actively down-cutting, severely degraded section of the Middle Ponil.

Potential funding sources for the project include NMGF and potential grants through the Cimarron Watershed Alliance. The complete restoration plan is included in Appendix C.

North Ponil Assessment and Recommendations - This assessment, conducted by Rangeland Hands in the Spring of 2012, sought to estimate the annual sediment contribution into the stream from unstable

banks, to identify other probable sources of sediment contribution to the stream, and to identify other issues within the watershed that should be addressed. The assessment made the following stabilization and restoration recommendations for the North Ponil Watershed:

1) Change the current grazing management plan;
2) Stabilize, upgrade, and properly drain the low standard dirt road along the North Ponil, to include stabilizing the low water crossings;
3) Restoration of the North Ponil Creek channel to stabilize the stream channel and to reduce erosion and sedimentation.

At present, this is a conceptual project. Efforts have not been made to further develop this potential project or to pursue funding, but the assessment has identified the issues within the watershed and provided awareness of them. The complete assessment report is included in Appendix D and is included in the Cimarron Watershed-Based Plan.

Middle Ponil Assessment and Recommendations - This assessment, conducted by Rangeland Hands in the Spring of 2012, sought to estimate the annual sediment contribution into the stream from unstable banks, to identify other probable sources of sediment contribution to the stream, and to identify other issues within the watershed that should be addressed. The assessment made the following stabilization and restoration recommendations for the Middle Ponil Watershed:

1) Reconfigure the Ponil Camp corral and restore the creek next to it;
2) Stabilize, upgrade, and properly drain the low standard dirt road along the North Ponil, to include stabilizing the low water crossings;
3) Restoration of the Middle Ponil Creek channel to stabilize the stream channel and to reduce erosion and sedimentation.

At present, this is a conceptual project. Efforts have not been made to further develop this potential project or to pursue funding, but the assessment has identified the issues within the watershed and provided awareness of them. The complete assessment report is included in Appendix D and is included in the Cimarron Watershed-Based Plan.

Middle Ponil Watershed Collaborative Forest Restoration Program Planning Project Proposal - This project proposal was submitted by the Cimarron Watershed Alliance in collaboration with the Questa Ranger District of the Carson National Forest and the New Mexico Game and Fish Department. The project proposed to undertake a three year planning process to assess ecological restoration needs within the Middle Ponil Watershed on the Barker WMA (owned by NMGF) and on a section of the Valle Vidal Unit of the Carson National Forest. This proposal was submitted in 2011 and in 2012, but was not funded. However, the Cimarron Watershed Alliance, the Questa Ranger District, and the New Mexico Department of Game and Fish are committed to restoration in this area of the Middle Ponil Watershed and will continue to collaborate and pursue funding for planning and restoration projects in this area.

Other Restoration Needs and Potential Projects in the Ponil Creek System - Historic and ongoing impacts within the watershed have contributed to water quality impairments in the Ponil Creek system and to numerous issues within the rest of the watershed. These impacts have reduced the ability of the

Ponil Creek and Watershed to function as a healthy ecosystem. In addition to the temperature impairment of the Middle Ponil, many other reaches of the Ponil Creek system have listed impairments including temperature, nutrients, *E. coli*, and turbidity. Many areas of the Ponil Watershed remain in an unstable, downward trend due to these historic and ongoing impacts.

The landowners within the watershed continue to plan and implement improved land management practices and restoration projects on their properties. The Cimarron Watershed Alliance is committed to supporting all the landowners within the watershed and the watershed health practices and projects that they are planning and implementing. The CWA will also continue to partner with these landowners to plan and implement collaborative projects in support of water quality and watershed health.

7. Supplemental Information:

- Appendix A – Monitoring
    - Monitoring Map and Locations
    - Photo Points
    - Cross Sections – includes 2011 Ponil Workshop Data
    - Canopy Density Summary 2009 vs 2012
    - Water and Ambient Air Temperature Summary for 2012
- Appendix B – Ponil Creek II Restoration Proposal
- Appendix C – Restoration Plan for Bonita-Ponil Confluence, Elliot Barker Wildlife Area
- Appendix D – Assessment
    - Middle Ponil / Barker WMA to Philmont Ponil Camp Watershed Assessment Report
    - North Ponil Creek Philmont Scout Ranch Watershed Assessment Report
- Appendix E – New Mexico Game and Fish Middle Ponil Creek Project Final Report (Low Water Crossing Project)