Attachment A: Project Work Plan

A. Project Title

Rincon Arroyo Watershed Stabilization Project to Reduce *E. coli* loading to the Rio Grande

B. Applicant Information

Organization:	The Regents of New Mexico State University		
Address:	Anderson Hall E1200 Corner of Espina and Stewart St., Las Cruces, NM 88003-8002		
Contact Person:	Alisha A. Giron	Title:	Asst. VP, Research Admin.
Phone:	575-646-1590	Email:	ras@nmsu.edu
FED. Tax ID #	85-6000401	Date of Incorporation:	1888 *(non-profits only)*

C. Project Manager

The project manager is responsible for oversight of the approved project including: administering contracts; ensuring technical viability of the project; ensuring funds expended are within the budget and in accordance with applicable law; and ensuring that quarterly fiscal and technical progress reports, and a final report, are submitted to NMED.

Name:	Sam Fernald		
Address:	3170 S. Espina St. Las Cruces, NM 88003-8001		
Organization:	New Mexico Water Resources Research Institute (NM WRRI)		
Phone:	575-646-4337	Email:	afernald@nmsu.edu

D. Start and End Dates

Planned project start date:	07/01/2020	Planned project end date:	06/30/2023

E. Plan Citation

Paso del Norte Watershed Council (PdNWC). 2014. The Paso del Norte Watershed Based Plan Mitigation Measures to Reduce Bacterial Pollution in the Rio Grande. https://www.env.nm.gov/wp-content/uploads/sites/25/2017/06/PdNWC_WBP_Final_5-27-14.pdf

F. Planning Feedback

The WBP gives a thorough overview of planning considerations for this region, the Hatch and Mesilla Valleys. As is common, little data were available to predict the effect of best management practices (BMP's) in restoration projects such as these, where the approach is to slow and spread "flashy" flood flow, to both settle out bacterial and sediment transport (which can then harbor *E. coli*), and support increased vegetation cover to further increase infiltration and decrease hydrologic energy. The scale of needed restoration for stakeholders across arid rangelands is often overwhelming, and thus the ability to predict benefits is critical. The results of this project and the data from the effectiveness monitoring will link quantified effects to ecohydrologic landscape indicators that are used in management analysis. This information may help inform a future update to the WBP.

G. Project Area

Assessment Units name and ID:	NM-2101_10: Rio Grande (Leasburg Dam to one mile below Percha Dam)
12-digit Watersheds:	Phase I (addressed in this project) 130301020304 – Outlet Rincon Arroyo
Project area (stream miles):	Effect of watershed site is to approximately 14 miles of this Rio Grande assessment unit (NM-2101_10), including the impaired reach from the Rincon Arroyo outlet (at location of water quality station: RIO GRANDE NEAR RINCON AT NM 140 - 42RGrand126.9) to Leasburg.
Project Area:	Phase I (this project): the restoration addresses a 154-acre subbasin with practices on 10.2 acres and a 126-acre subbasin with practices on 9.5 acres with structures that are spread across the entirety of the two subbasins, compared to a similar control subbasin of 90 acres.
Project area map:	See attached project area map, below.

H. Problem Description

Assessment Unit ID	**Assessment Unit Name**	**Impairment Parameters**
NM-2101_10	Rio Grande (Leasburg Dam to one mile below Percha Dam)	TMDL for *E. coli*. Category 4A.
Assessment Unit Narrative The 2018 - 2020 State of New Mexico Clean Water Act §303(d)/§305(b) Integrated Report and the included Integrated List for assessment unit NM-2101_10 show the Rio Grande (Leasburg Dam to one mile below Percha Dam) is non supporting for Primary Contact for *E. coli* (NMED/SWQB, 2018, p242), by exceeding the standard requirement of the monthly geometric mean of *E. coli* bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less. A TMDL was calculated for the main stem of the Rio Grande in New Mexico below Elephant Butte Dam. The resulting document, Total Maximum Daily Load (TMDL) for the		

Main Stem of the Lower Rio Grande (from The International Boundary with Mexico to Elephant Butte Dam) was completed in 2007 (PdNWC WBP 2014, page 2). The following sections 1 through 5 detail the impairment scope and the conditions for impairment:
--1) Impairment: The largest source of *E. coli* pollutant to the impaired stretches of the Rio Grande in the Hatch and Mesilla Valley is from watershed range sources, as 41% is from livestock and wildlife sources (other than waterfowl) as measured from four representative sites in the region (PdNWC WBP 2014, p. 19). Most relevant to this project, the Rincon Arroyo watershed, 32% is from watershed range sources at the Leasburg Dam observation site on the Rio Grande, which is the approximately 14 miles downstream from the Rincon Arroyo outlet to the Rio Grande. The Rincon Arroyo watershed has been identified by the land manager stakeholders as the highest priority watershed for this impaired reach, and the sediment transport is estimated to be the highest for the Hatch and Mesilla Valley, at a rate of 36.2 acre-feet per year (AFY) (TTI and DSS, 2015).
--2) "Watershed natural structure" – "vegetation cover" conditions contributing to impairment: The condition of the watershed natural structure, particularly vegetation cover (as measured by % natural cover), influences nonpoint source pollution (NPS) as good vegetation cover conditions result in "decreased sheet flow, increased infiltration, decreased runoff and associated contaminants, reduced erosion and development of a healthier biotic community in the watershed" (PdNWC WBP 2014, p. 35), and thus an increase in vegetation cover is a goal to address the impairment. This area has a high percentage of bare ground (quantitative analysis using NDVI to be provided in this study), including roads that do not have infrastructure to manage the flow, increase flow energy, and result in significant transport and erosion, as communicated by stakeholders in the region, including the three main ranchers of the watershed and BLM managers. They have shared that vegetation cover has decreased in the region generally due to their perceived growing aridity, occurrences of drought, and potentially land management grazing practices out of coordination with the climatic conditions. (Also note the discussion in the management measures section that the historical vegetation cover on floodplains as measured by NDVI will be correlated to flows and restoration results and adjusted by a control region).
--3) "Flow and channel dynamics" conditions contributing to impairment – high energy "flashy" flood dynamics, which also result in sediment transport and low "soil stability": High hydrologic energy transports contaminants and sediment that harbors *E. coli* contaminants (Fluke et al. 2019). Hydrologic energy increases as vegetation density declines, as surface roughness exerts strong control over infiltration in dryland (arid and semi-arid regions) (Wilcox et al. 2003). The WBP states that "pollutant loading in the watershed upstream from Leasburg Dam is primarily related to storm related runoff that can best be described as flash flooding" (PdNWC WBP 2014, p. 37). Thus mitigation of hydrologic energy is a goal to address the impairment. Stakeholders in the Stormwater Coalition, including the Doña Ana Flood Commission, have shared that flooding and the intensity of flood events has been increasing, and that watershed restoration is a critical priority to address the source of the problem.
--4) "Ecological history" and disturbance conditions contributing to impairment – drought and reduction of upland water soil moisture: the increased occurrence of drought in the region contributes to vegetation loss and increases in hydrologic energy and sediment and NPS transport.

--5) “Social context” conditions contributing to impairment – “level of information, certainty and planning to achieve large watershed management potential”: Quantification of the benefits of watershed restoration practices that slow and spread the flow for this region are critical to be able to achieve the targeted goals of reducing sediment and bacterial contaminant transport on the scale of the Rincon Arroyo watershed and then across the Hatch and Mesilla Valleys. Predictive modeling approaches that quantitatively link structure to processes which achieve ecological and social benefits are needed to increase the rate of restoration success in drylands (James et al. 2013). This project will serve as a Phase I to one or more larger projects, and will provide information critically needed by the stakeholders as to the efficacy and benefits of the practices.

References:

Fluke, J., R. GonzálezPinzón, and B. Thomson. 2019. Riverbed sediments control the spatiotemporal variability of *E. coli* in a highly managed, arid river. Front. Water 1.

James, J. J., R. L. Sheley, T. Erickson, K. S. Rollins, M. H. Taylor, and K. W. Dixon. 2013. A systems approach to restoring degraded drylands. Journal of Applied Ecology 50:730-739.

New Mexico Environment Department/Surface Water Quality Bureau (NMED/SWQB). 2018a. 2018

2020 State of New Mexico Clean Water Act Section 303(d)/ Section 305(b) Integrated Report. 64 pp.

New Mexico Environment Department/Surface Water Quality Bureau (NMED/SWQB). 2018b. 2018

2020 State of New Mexico Clean Water Act Section 303(d)/ Section 305(b) Integrated Report. Appendix A 303(d)/305(b) List. 369 pp.

Tetra Tech Inc. (TTI), and Del Sur Surveying LLC (DSS). 2015. Surveyor’s Report

IBWC Channel Maintenance Alternatives and Sediment Transport Studies for the Rio Grande Canalization Project; Contract No. IBM09D0006. USIBWC.

Wilcox, B. P., D. D. Breshears, and C. D. Allen. 2003. Ecohydrology of a Resource

Conserving Semiarid Woodland: Effects of Scale and Disturbance. Ecological Monographs 73:223-239.

I. Goals

Assessment Unit ID	**Assessment Unit Name**	**Current Impairment Parameters**	**Load Reduction Goal of Proposed Project**
NM-2101_10	Rio Grande (Leasburg Dam to one mile below Percha Dam)	TMDL for *E. coli*. Category 4A.	Impairment Goal: Load reduction from treated areas by factor of 2 (3.2 x 10^9 CFU *E. coli*/day)

Assessment Unit ID	Assessment Unit Name	Current Impairment Parameters	Load Reduction Goal of Proposed Project

Goal Narrative

Here we provide more information about the impairment goal, and then (briefly) more information about four additional interrelated hydrologic and social goals.

1) Impairment Goal: We estimate that the restoration approach conservatively will reduce the loading from this Phase I project by a factor of 2. Based upon the 2007 NMED TMDL document (as summarized in the PdNWC WBP 2014) of the average load for a mid-point flow from this impaired reach of 4.0 x 10^13 CFU/day, our estimation of the load contribution from this Phase I project subbasin is 6.5 x 10^9 CFU/day. Our target is thus a load reduction of a minimum of 3.2 x 10^9 CFU/day (day of flow events). Our approach has been documented to be particularly effective. Use of vegetation and incorporation of vegetative strips have been used to reduce *E. coli* numbers from farm and landscape water flow. For example, in annual grasslands, Tate et al. (2006), reported *E. coli* load reductions up to 48% (the reductions ranged from log 0.3 to log 3), depending on the width of the strips used. Parajuli et al. installed vegetative strips at the landscape level to reduce loading in a northern Kansas watershed. Installation of vegetative strips reduced approximately 60% of the *E. coli* load and 63% of sediments (Parajuli et al. 2008). Staddon et al. (2001) documented 100-fold higher retention of Gram-negative bacteria in vegetated strips compared to bare soil (*E. coli* is Gram-negative). Based on these estimates (and others such as Harmet et al. 2018), we conservatively predict that we can reduce landscape-derived portion of the loading by a factor of 2. As to the mechanisms of *E. coli* retention in vegetative strips, sorption of bacteria to plant material and soils and specific attachment to plant roots is well-documented in the literature (e.g., Marshall, 1969; Dennis et al. 2010). The retention and sorption capacity of soils and plant roots for bacteria are high, and the expectation is the cells are strongly retained. For example Bashan and Levanony (1988) found the adsorption of a Gram-negative bacterium to soils was not reversible by water washing. This phase I project will establish indicators for *E. coli* load reduction that will be linked to key ecohydrologic indicators that are inputs to other landscape assessments, such as hydrologic modeling. This will produce *E. coli* indicators that will be generalizable to the region.

2) Vegetation cover conditions goal: Increase the vegetation cover by 10% from the additional water supply to floodplain regions of 3 estimated flows in each of two monsoonal seasons (by the end of 2023).

3) Flow and channel dynamics goal: Create a reduction in flow that is equivalent to reducing a 25-year 24-hour event to a 10-year 24 event by the e.o. 2023 (peak and volume reductions of approx. 1/3), and reduce E. coli and sediment transport.

4) Ecological history (decreasing soil moisture) conditions goal: Increase the area of infiltration (connectivity of flood flow to floodplains) from 27% of the floodplain in a 10-year event to 90%.

Assessment Unit ID	Assessment Unit Name	Current Impairment Parameters	Load Reduction Goal of Proposed Project

5) Social context conditions goal – level of information, certainty and planning to achieve large watershed management potential: Produce a comprehensive quantitative indicator package (which synthesizes the results from the goals 1-4) that estimates of the extent of watershed restoration which is generalizable for future planning of this region, particularly the Rincon Arroyo Watershed and other watersheds in the Hatch and Mesilla Valley.

References:

Bashan, Y. and H. Levanony. 1988. Adsorption of rhizosphere bacterium Azospirillum brasilense to soil, sand and peat particles. J. Gen. Microbiol. 134: 1811-1820.

Dennis, P.G., A.J. Miller and P.R. Hirsch. 2010. Are root exudates more important than other sources of rhizodeposits in structuring rhizosphere bacterial communities? FEMS Microbiology Ecoogy. 72:313-327

Harmet et al. 2018. Vegetated treatment area (VTAs) efficiencies for E. coli and nutrient removal on small-scale swine operations. Internat. Soil Water Conserv. Res. 6:153-164

Marshall, K.C. 1969. Studies by Microelectrophoretic and Microscopic Techniques of the Sorption of Illite and Montmorillonite to Rhizobia . J. Gen. Microbiol. 56:301-306.

P.B. Parajuli P., K.R. Mankin, P.Barnes, 2008. Applicability of targeting vegetative filter strips to abate fecal bacteria and sediment yield using SWAT Ag. Water Mange. 95:1189-1200.

Staddon, A.W., M.A. Locke and R. J. Zablotowicz. 2001. Microbiological characteristics of a vegetative buffer strip soil and degradation and sorption of Metalochlor. Soil Sci. Soc. Amer. 65:1136-1142.

USACE, H. E. C. HEC-HMS. http://www.hec.usace.army.mil/software/hec-hms/

USDA-NRCS. 2004. Part 630 Hydrology: Chapter 10 Estimation of Direct Runoff from Storm Rainfall. National Engineering Handbook. Washington, DC, USA: Natural Resources Conversation Services, US Department of Agriculture.

J. Management Measures

Management Measure #1: Contour stone lines
Management Measure #1 Description: Approximately 18 (including approx. 2,700 lineal feet) contour stone lines are planned for installation, to be confirmed upon onsite surveys. Contour stone lines (Mekdaschi and Liniger, 2013) are surface runoff water management, soil conservation, and erosion mitigation measures in the flatter upland flow areas that have access for stone delivery. The function is to spread, not impound, water upstream before it enters arroyo flow, through increasing infiltration, recruiting vegetation, trapping soil and sediment behind structure, and increasing productivity for managed grazing. A stone line is typically 10’ (25 cm) high and has a base width of 14”-16” (35-40 cm). It is constructed of a mixture of small and large stones along the contour and across a field. Smaller

stones are placed upslope and the larger ones underneath to slow down runoff, trap fertile soil sediment and enhance water infiltration. The distance between the lines depends on the slope and how many stones are available if locally sourced. The recommended spacing between lines for higher slopes is up to 100' apart, and for lower slopes, 65' (20m) for slopes less than 1%, and 50' (15m) for slopes of 1-2%. Stones would likely be brought in from an offsite quarry despite the availability of stone in the locations anticipated due to the quantity required for each line. Thus these lines are in locations that have adequate access.

References:

Mekdaschi, R., and H. Liniger. 2013. Water harvesting: guidelines to good practice. Centre for Development and Environment (CDE), Bern; Rainwater Harvesting Implementation Network (RAIN), Amsterdam; MetaMeta, Wageningen; The International Fund for Agricultural Development (IFAD), Rome.

Management Measure #2: Contour wire and brush lines

Management Measure #2 Description: Approximately 40 (including approx. 7,100 lineal feet) contour wire and/or brush lines are planned for installation, to be confirmed upon onsite surveys. Contour wire and/or brush lines, or net wire diversions (USDA NRCS, 2016) are surface runoff water management, soil conservation, and erosion mitigation measures in the flat upland flow areas. The practice objective is to control or protect range land from gully and/or sheet erosion, and head cuts caused by runoff with excess volume or energy by diverting it to protected areas, spreading and/or reducing the velocity of flow. The function is to spread not impound water upstream before it enters arroyo flow, through increasing infiltration, recruiting vegetation, trapping soil and sediment behind structure, and increasing productivity for managed grazing. A wire and/or brush contour line, or net wire diversion is a low profile 10'-12" galvanized mesh wire and/or brush as a continuous horizontal porous obstruction to flow held by posts 10' maximum on center. Brush is locally collected if available or brought to the site.

References:

USDA NRCS. 2016. NRCS Field Office Technical Guide (FOTG) Arizona: Conservation Practice Standard Diversion Code 362. https://efotg.sc.egov.usda.gov/references/public/AZ/161001_362_DiversionStandard.pdf

Management Measure #3: Microcatchments

Management Measure #3 Description: Approximately 1,000 microcatchment systems are planned for installation. Microcatchment systems (Mekdaschi and Liniger, 2013) use various small stone bunds, including curved and semi-circular, or small brush weirs placed on and maintain contours for surface runoff water management, soil conservation, and erosion mitigation measures for runoff from relatively small catchment areas (up to 2 acres). Areas for treatment are upstream from defined drainage areas (arroyos) that exhibit erosion and entrenchment. In this project, practices planned to be installed in the headwaters above arroyos are eyebrow stone bunds (approx. 910) and in upland areas are media lunas (Maestas et al 2018) or demi-lunes (approx. 90). The practice objective is to control or protect range land from gully and/or sheet erosion, and head cuts caused by runoff with excess volume or energy. The function is to slow flow, capture sediment and nutrients to support revegetation and increased infiltration, and spread or maintain spread flow by maintaining a relatively consistent top surface on the contour. Note that these are not dams and are not intended to impound water, but are porous catchments. Eyebrow stone bunds are small structures intended to slow flow in the upland rills above arroyos to create a low profile terracing effect. The structures are permeable, and overflow is intended to overtop the structures, requiring the height to remain shallow to prevent the flood flow from increasing energy through waterfalling, similar in function to a one-rock dam. The materials are to be commonly collected onsite if this does not compromise the site ecological integrity. Rock, including sizes between cobbles (2.5”) and boulders (10”), and/or brush debris is collected and used. When using brush for headwater rills above arroyos, the approach of brush weirs is modified to be smaller and span the rill to maintain the contour of the rill bank. Media lunas (or demi-lunes) are stone bunds that create a depositional area upstream of the structure and either spread or maintain spread sheet flow.

References:

Maestas, J., S. Conner, B. Zeedyk, B. Neeley, R. Rondeau, N. Seward, T. Chapman, and R. Murph. 2018. Hand-built structures for restoring degraded meadows in sagebrush rangelands: examples and lessons learned from the Upper Gunnison River Basin, Colorado. Range technical note; No. 40.

Mekdaschi and Liniger, 2013 (see Measure 2 for reference).

Management Measure #4: Native grass seeding

Management Measure #4 Description: All of the management measures have objectives to increase vegetation to support functions of reducing runoff and in Management Measures 1-3, contour stone lines, contour wire and brush lines, and microcatchments, we will introduce grass seed to a minimum of 5% of the structures in the first year across a range of conditions, and if successful in areas of flow, application to the successful conditions in the subsequent years. Seed will be applied in order to reduce loss by wind and animals and encourage germination collaborating with current research (Dr. Faist, Rutter, 2019) and team input and placed on the soil upstream of the structure where flow will accumulate.

References:

Rutter, M. R. 2019. NMSU researcher, collaborators work to create best tools to help restore landscapes with native seeds.). New Mexico State University News Center. Las Cruces, NM. https://newscenter.nmsu.edu/Articles/view/13781/nmsu-researcher-collaborators-work-to-create-best-tools-to-help-restore-landscapes-with-native-seeds

Management Measure #5: One-rock dams

Management Measure #5 Description: Approximately 7 one-rock dams are planned for installation. One rock dams are runoff water management, soil conservation, and erosion mitigation measures in arroyos that exhibit downstream erosion and entrenchment and have enough width to establish in-channel bars. The practice objective is to control or protect range land from gully erosion, and head cuts caused by runoff with excess volume or energy. The function is to slow flow, capture sediment and nutrients to support revegetation and increased infiltration. The structure has a low profile on the landscape. Per Maestas et al. (2018), placement

of one rock dams vary with channel type and morphology, with key features that they are a) built to only one rock high (generally no more than a third the height of the bankfull channel), and b) built with a footer for splash apron on the downstream end that extends far enough (2x the height of the structure) to intercept water. References: Maestas et al., 2018 (See Measure 3 for reference)
Management Measure #6: Protection of treated areas from grazing
Management Measure #6 Description: Fencing for cattle exclosure shall be placed around the majority of the restoration treatment and control subbasin (over 80%) with a section left unprotected to compare project performance under typical Southwest and regional range conditions. Approximately 39,000 lineal feet of fencing are planned for installation.
Management Measure #7: Education and Outreach, (including workshop that achieves road restoration)
Management Measure #7 Description: Restoration of 3,000 feet of roads is planned to be in collaboration with and training of road maintenance crews from the County and BLM using rolling dips (on the county road) and water bars (on the rarely used/abandoned power line access road) (Zeedyk, 2006) that maintain the road velocity through the areas to not result in erosion by diverting a portion of the flow from the road through gravity. To achieve our education and outreach / social context conditions goal – the level of information, certainty and planning to achieve large watershed management potential – we will have a steering committee of stakeholders, meet quarterly, and conduct field trips to assess the restoration implementation, results, and potential benefits. This assessment will be conducted collaboratively with the steering committee and other stakeholders. The team will work with the group to confirm, further develop, and refine how these findings establish generalizable indicators that allow for estimation of extent of restoration required to achieve goals in the region. The final indicators (with data and methods to arrive at these indicators) will be captured in a final report for this project that will include the relevant estimation methods to predict the effect of each restoration practice. References: Zeedyk, B. 2006. Water harvesting from low-standard rural roads. Santa Fe, NM: Quivira Coalition.

K. Key Persons

Key Person 1:	**Dr. Alexander (Sam) Fernald**	**NMWRRI at New Mexico State University (NMSU)**	**Project Manager**
Key Person 1 Qualification Summary:	Sam Fernald is the Director of the Federally and State supported New Mexico Water Resources Research Institute (NM WRRI). Dr. Fernald leads the institute in its mission of developing and disseminating knowledge through research and on-the-ground collaborative projects with stakeholders that will assist the state, region, and nation in solving water resources problems. The NM WRRI, one of 54 water institutes in the nation, encourages university faculty statewide to pursue critical areas of water resources research while		

	providing training opportunities for students, and provides an outlet for transferring research findings to the academic community, water managers and the general public. Professor Fernald also is a Professor of Watershed Management in the Department of Animal and Range Sciences at New Mexico State University. Dr. Fernald's earned degrees include a 1987 B.A. in international relations from Stanford University, an M.E.M. in 1993 in water and air resources from Duke University, and a Ph.D. in watershed science from Colorado State University in 1997.		
Contractor?	No		
Matching effort?	No		
Key Person 2:	**Connie Maxwell**	**NM WRRI / South Central Stormwater Management Coalition (Stormwater Coalition)**	**Project Leader**
Key Person 2 Qualification Summary:	Ms. Maxwell is an ecological planner who works with communities on local and regional levels. Her current work is a graduate research assistant with New Mexico Water Resources Research Institute (NM WRRI) while pursuing a doctorate at NMSU in the Water Science and Management Program under Dr. Sam Fernald's advisement. Her work has focused upon working with the Stormwater Coalition stakeholder group to design and conduct watershed restoration within the Hatch/Rincon and Mesilla valleys. The Rincon Arroyo watershed has served as a priority project and has been the subject of her doctoral research which provides the basis for this project. Ms. Maxwell plans to complete her PhD prior to the start of this project and continue at the NM WRRI as a Postdoctoral Scholar. She holds a Master's degree from UNM in Community and Regional Planning with a concentration in Natural Resources and a Bachelors of arts in English and Architecture from Columbia University. Maxwell co-founded the non-profit organization, the Alamosa Land Institute (ALI), in 2010 to engage in ecological planning and restoration with farmers and ranchers. ALI has been collaboratively introducing and testing innovative land management practices which focus upon restoring arroyos, riparian and agricultural valleys to slow and retain stormwater in watersheds, reduce sediment and pollutant transports, and recharge aquifers.		
Contractor?	No		

Matching effort?	Not for Ms. Maxwell, howevershe will direct one student in coordination with other team experts (NMWRRI Graduate Assistant in the budget), which will be covered by 66% match. See budget for figures.		
Key Person 3:	**Dr. Geoffrey Smith**	**NMSU**	***E. coli* testing**
Key Person 3 Qualification Summary:	Smith has directed the Microbiological component of three New Mexico Watershed studies based in the Cimarron, Lower Rio Grande and San Juan watersheds, which includes the WBP that governs for this project (PdNWC WBP 2014). He has over 50 publications in the Environmental Microbiology literature.		
Contractor?	No		
Matching effort?	Dr. Smith will provide 100% match in his services, as well he will direct one student (Community Hydrology Student Assistant in the budget), which will be covered by 66% match. See budget for figures.		
Key Person 4:	**Dr. J. Philip King, PE, MBA**	**King Hydrology**	**Hydrologic modeling**
Key Person 4 Qualification Summary:	Dr. King's contribution to this stakeholder-driven Phase I watershed restoration in the Rincon Arroyo watershed will be to advise on the hydrologic modeling in the project and to provide assessment of the assumptions, conceptual model, parameterization, calibration, outputs, and interpretation of results. He and other team members will also work with Dr. Geoffrey Smith to assess the relationship between episodic arroyo flow and the occurrence of *E. coli* in the runoff. He is uniquely qualified for these project activities. He has a long history of involvement in watershed management issues in south-central New Mexico. He has been on the faculty at New Mexico State University for thirty years as a Civil/Agricultural Engineer. His research includes several projects focusing on the hydrologic and hydraulic modeling of the surface water-groundwater processes of the Rio Grande. This work includes a study with Dr. Geoffrey Smith on the occurrence and sources of *E. coli* in the Rio Grande, funded by the Paso del Norte Watershed Council. He served as chair of the Board of Directors of the Doña Ana Soil and Water Conservation District and the Governor's designee to the NM Soil and Water Conservation Commission for two governors, roles in which he collaborated extensively with the South-Central New Mexico Stormwater Management Coalition. For more than 25 years, he has been a consultant for Elephant Butte Irrigation District (EBID), and his		

	work has given him unique perspective into the hydrology, hydraulics, institutional, and cultural environment of the Rio Grande.		
Contractor?	Yes		
Matching effort?	Dr. King will provide 20 hours match (16.7%). See budget for figures.		
Key Person 5:	**John Gwynne, P.E., CFM**	**Stormwater Coalition / DACFC**	**Steering Committee member**
Key Person 5 Qualification Summary:	Mr. Gwynne is the director of the Doña Ana County Flood Commission (DACFC) and the president of the Stormwater Coalition. He has been an active proponent of watershed restoration in the region and has decades of experience managing stormwater and coordinating with land and water managers in the region. He currently describes this effort as a "fundamental change in our philosophy from rushing to get stormwater as quickly as possible to the river to keeping the water in the watersheds for its functions there and capturing what we can."		
Contractor?	No		
Matching effort?	Mr. Gwynne will provide 54 hours of match (100% of his time), as well as contribute high resolution (1ft) DEM datasets to assess the previous erosion on the project site. See budget for figures.		
Key Person 6:	**Zachary Libbin, P.E.**	**Stormwater Coalition / EBID**	**Steering Committee member**
Key Person 6 Qualification Summary:	Mr. Libbin, the District Engineer at Elephant Butte Irrigation District (EBID), has been among the most active leaders of the Stormwater Coalition, serving as president for several years, as well as an active proponent of pursing watershed restoration in the region. Mr. Libbin led the effort to engage the NRCS and pursue their small watershed program to restore the entirety of the Rincon Arroyo watershed. EBID has been a leader of both the formation in 2011 of the Stormwater Coalition and the continuing management which has spanned over the last two decades. EBID commits to remain a key partner within the Stormwater Coalition and work to collaboratively further the goals of the collective group. EBID has long been actively engaged as well in addressing issues related to the establishment and maintenance of a viable watershed, specifically the watershed that is below Elephant Butte Reservoir in southern New Mexico, that contains the Hatch and Mesilla Valleys. EBID is the largest Reclamation irrigation district in New Mexico and play a major role in supplying surface water to their members in South Central New		

	Mexico and West Texas and coordinating with other land and water managers under the Rio Grande Project.		
Contractor?	No		
Matching effort?	Mr. Libbin and other EBID employees will provide 54 and 92 hours of match respectively (100% of time). See budget for figures.		
Key Person 7:	**Jessica Knopic**	**BLM LCDO**	**Steering Committee member and key project contact**
Key Person 7 Qualification Summary:	Ms. Knopic is a civil engineer and has been on the Stormwater Coalition's Rincon Arroyo / watershed restoration working group since its inception for the last three years. As the land owner, the Bureau of Land Management's Las Cruces District Office (BLM LCDO) values the collaboration with and has supported the stakeholder-driven watershed restoration efforts of the Stormwater Coalition to address the issues resulting from growing aridity and occurrences of drought in the entirety of the Hatch and Mesilla Valley.		
Contractor?	No		
Matching effort?	No. Ms. Knopic, and other BLM employees involved in clearances, are federal employees whose job duties support the proposed project.		
Key Person 8:	**Susie Downs**	**CSWCD**	**Steering Committee member**
Key Person 8 Qualification Summary:	With the majority of Rincon Arroyo being within the boundaries of the Caballo Soil and Water Conservation District (CSWCD), the District is in support of this project, and Ms. Downs has been an active member of the Stormwater Coalition Watershed Restoration working group for over three years. The CSWD strives to promote water quality, soil health, erosion control and to conserve our natural resources for the utilization of our future generations, all of which will be addressed in this project. The value of the information that will be gathered through this project will be beneficial to all partners for future projects.		
Contractor?	No		
Matching effort?	Ms. Downs will provide 54 hours of match (100% of her time). See budget for figures.		
Key Person 9:	**Chris Canavan**	**Blue Heron Enterprises, LLC**	**Technical consultant. Liaison with USACE**

			and NMED for 404 permit clearance.
Key Person 9 Qualification Summary:	Mr. Canavan worked for the Surface Water Quality Bureau of the New Mexico Environment Department, where he was an Environmental Scientist-Supervisor, with 14 years of experience with NMED and 24 years of combined experience working in surface water quality. He retired from state employment at the end of 2018. During his time with NMED he was the project officer overseeing the PdNWC WBP and was responsible for the final draft of the plan. He also was responsible for drafting Section 401 certifications of USACE Section 404 permits. He currently teaches Watershed Management 318/518 in the Range Science Department at NMSU. EDUCATION- M.S. Interdisciplinary Studies (Limnology and Analytical Chemistry (1998), New Mexico State, B.S. Biology New Mexico State (1989), B.A. English New Mexico State (1988). EXPERTISE- watershed restoration plan development and implementation, fluvial geomorphology, technical writing (reports and grants), NEPA compliance reviews, water quality sampling and analysis. Mr. Canavan was also field project co-lead on the abiotic component (geomorphology) of the Gila, Playa lakes and Rio Grande/Pecos Rapid Assessment Method developed by NMED.		
Contractor?	Yes		
Matching effort?	Mr. Canavan will provide 80% match and require 20% reimbursement for his services. See budget for figures.		
Key Person 10:	**Chuck Caruso**	AGRIMEX	**Advisement on the planning, design and supervision of the installation of restoration practices**
Key Person 10 Qualification Summary:	Mr. Caruso has over 55 years of experience, including 34 years with the USDA- Natural Resources Conservation Service in New Mexico, installing upper watershed treatment measures to reduce erosion and increase vegetation on arid watersheds, similar to the proposed treatment on the Rincon Watershed Area. AGRIMEX is looking forward to assisting the sponsors of this project which will hopefully serve as a catalyst for the renovation of the entire Rincon Watershed.		
Contractor?	Yes		
Matching effort?	No		

Key Person 11:	**Bidded installer – tbd**		
Key Person 11 Qualification Summary:	The contractor scopes of surveying and restoration installation will be bid.		
Contractor?	Yes		
Matching effort?	No		

L. Complementary Programs and Match

See budget for match amounts.--The New Mexico Water Resources Research Institute (NM WRRI) has a complementary program entitled the "Community Hydrology program" which shares goals with and will be funding activities which contribute to this project. The state funded Community Hydrology program emphasizes stakeholder input for targeted research to improve water management in New Mexico. This project to restore the Rincon Arroyo qualifies for the Community Hydrology program. NM WRRI will contribute labor and equipment to help with management goals to measure project impact on *E. coli* loads and to characterize on the ground restoration construction and impact for scaling to larger watershed restoration efforts. NM WRRI NMSU also has access to extensive laboratory testing facilities, the value of which contributes a match to this project.

–King Engineering & Associates, Inc. is involved in a complementary program with the Elephant Butte Irrigation District which shares goals with and will be funding activities which contribute to this project.

–The Steering Committee members and staff from their respective agencies and companies have been actively working towards achieving watershed restoration in the Hatch and Mesilla Valley and will be contributing effort towards this project.

–Project advisor Chris Canavan has been involved with the Stormwater Coalition and will be a technical advisor to the team and join the Steering Committee at key intervals.

–A criterion for contractor selection will be their ability to provide a match for their labor services. The match provided in the budget is based upon a Southwest Conservation Corps (SCC) estimate and represents a non-federal source of match which is the difference between the dollar value of volunteer time and the amount which SCC charges sponsors (corpsmember living allowances plus FICA and UI).

–Members of the Stormwater Coalition as collaborators on the project providing input, feedback, and study of the project as it affects their jurisdiction. In-kind match for their time attending meetings, field visits, and potential volunteer activities is provided in the budget at a rate of $25 hour.

- Forgone indirect costs – indirect costs cover administrative support from NM WRRI, which for this project would be an off-site rate of 26%. The match is the difference between the rate and the 10% of the entire project costs.

M.Clearances

The team will meet with the ACOE to present the project and secure any required Nationwide (404) permits. As the landowner, BLM commits to working with the team to complete the site specific analysis and clearances as required by NEPA and Bureau policy. BLM will work collaboratively toward the planned construction implementation goal of prior to the 2021 monsoon season, with the planned construction approximate start date between April 15th and May 15th, 2021. The Las Cruces District Office (LCDO) has begun a Programmatic Environmental Assessment NEPA process on the Rincon Arroyo watershed in anticipation of restoration efforts through various funding sources, with the NRCS small watershed program being a large focus. BLM anticipates the Programmatic Environmental Assessment for the larger Rincon Watershed Stabilization Strategy to be complete early in 2021, and this will facilitate site specific NEPA requirements in this project area.

N. Measures of Success

We have developed evaluation criteria for each of the goals listed in the Goals section above.
1) Indicators for impairment Goal Load reduction by factor of 2: We will estimate *E. coli* load transport using turbidity as a proxy, and produce quantitative links to vegetative cover (see measure 2) and hydrologic flow (see measure 3) to predict extent of treatment required to achieve goals. We will directly measure *E. coli* load from the restoration site and a control arroyo site directly adjacent, using EPA method 1603 for *E. coli* with data of critical interest from the summer monsoonal seasons of 2021, 2022, and 2023. We will use a Teledyne Avalanche Sampler (collects 4 samples and refrigerates them for up to 48 hours).
2) Indicators for vegetation cover conditions goal of 10% increase by 2023 (additionally as modified by a QAPP): To assess what percent vegetation cover change occurs due to the restoration measures, we will monitor the vegetation cover conditions with both remote sensing (NDVI on a 3m resolution) and field transect measures used by BLM for their AIM program for ground-truthing (Herrick 2017), corrected per the control subbasin conditions. To correlate the vegetation cover effect on hydrologic energy, specifically runoff peaks and volume, we will rerun our models and calibrate to the new runoff measures (see measure 3) to assess the changes to the Curve Number. This then provides indicator measures for i) the response of vegetation cover to restoration, ii) effect of vegetation on runoff, and iii) effect of vegetation on *E. coli* transport.
3) Indicators for flow and channel dynamics goal of hydrologic peak and volume reductions of approx. 1/3 (additionally as modified by a QAPP): Note that tying *E. coli* transport to hydrologic peaks and flow volume is more practical than trying to tie it to sediment transport for two reasons: i) reliable sediment transport measures directly from water sampling are

difficult to get, and ii) hydrologic dynamics are important to land managers and modeling is common. We will directly measure flow stage (height) and volume using a protected pressure transducer to derive runoff peaks and volume through model calibration at both the restoration subbasin and the control subbasin. Additionally we will directly measure infiltration rate using a submerged Alpha Mach iButton Temperature Rod, which uses temperature as a proxy to derive the infiltration rate (Moore 2007). This provides i) the effect of restoration on hydrologic energy, and ii) the ability to tie the other vegetation cover and *E. coli* load indicator measures to the hydrologic energy. We also predict that the reduction in hydrologic energy will reduce the site erosion by 20% as measured by the high resolution DEM's and LiDar provided by the Dona Ana Flood Commission (DACFC), and compared over preceding and upcoming periods. DACFC is contributing high resolution aerial photography and LiDAR that meets the USGS QL2 standard for the 134 square mile Rincon Arroyo watershed. The DACFC has been developing a comprehensive collection of data sets using aerial photography and LiDAR since 2004. Each data set provides a snapshot of this area that will be compared to other data sets to see erosional changes that will be tied to previously-modeled hydrologic events of different energies. We can also evaluate migrating arroyos and flow paths, and changes in vegetation density. We have gauge data for the watershed outlet and have completed hydrologic modeling calibrated to that data for 2008- 2013, the data from this project will be analyzed in comparison to those events to establish robust correlations between hydrologic energy, erosion, and *E. coli* NPS transport. We will compare the historic data sets to the hydrologic modeling, and the results of this project (2010, 2014, 2018, and planned 2022-23).

4) Indicators for ecological history (decreasing soil moisture) conditions goal - increasing the connectivity of flood flow to the floodplain in a 10-year event from 27% to 90% (additionally as modified by a QAPP): We will install iButton Thermistor temperature sensors along the surface from the channel into the floodplain to verify the extent of inundation at different flow stages. This provides i) the effect of restoration on connectivity of flood flow to the floodplain and thus area of infiltration, and ii) the ability to confirm the effect of the area of infiltration on hydrologic energy.

5) Social context conditions goal measures – level of information, certainty and planning to achieve large watershed management potential: The data and results of the quantitative indicators will be documented to provide standards that can be used as generalizable indicators for this region synthesized in the final report. The success measure will be the approval of the final Rincon Arroyo restoration plan by the steering committee, followed by collaborating stakeholders predicting benefits of further implementation in this region.

References:

Herrick, J. E., J. W. Van Zee, S. E. McCord, E. M. Courtright, J. W. Karl, and L. M. Burkett. 2017. Monitoring manual for grassland, shrubland and savanna ecosystems. Volume I: Quick Start. Volume II: Design, supplementary methods and interpretation. 0975555200. USDA - ARS Jornada Experimental Range: Las Cruces, New Mexico.

Moore, S. J. 2007. Streamflow, infiltration, and recharge in Arroyo Hondo, New Mexico: Chapter F in Ground-water recharge in the arid and semiarid southwestern United States (Professional Paper 1703). 2330-7102. US Geological Survey.

Planet Team. 2017. Planet Application Program Interface.). Space for Life on Earth. San Francisco, CA, USA: Planet Team.

O. Implementation Plan and Schedule

Task #	Task Title	Key Person	Planned Start Date	Planned End Date	Completion Benchmark
1	Project management and reporting	Sam Fernald	7/1/2020	6/30/2023	Final report submitted
2	Steering Committee	Connie Maxwell	7/1/2020	6/30/2023	Steering committee and stakeholders accept synthesis plan
3	Bid survey work & restoration work	Sam Fernald	7/1/2020	11/1/2020	Surveys contracted completed and restoration contract awarded
4	BLM required clearances	Jessica Knopic	Currently underway	No later than May 15th, 2021	BLM required clearances issued
5	ACOE permits	Connie Maxwell	7/1/2020	11/1/2020	ACOE issues either permit or determination of no permit required
6	QAPP for environmental monitoring and modeling	Connie Maxwell	8/1/2020	10/1/2020	QAPP complete and monitoring and modeling plans updated
7	Vegetation cover data collection and analysis	Connie Maxwell with students	September of each year	Each year December 1	Current vegetation cover conditions (NDVI and field cover) measures prior and after monsoon season
8.1	Installation of Management Measure: Stone Lines	Connie Maxwell working with contractors	4/15/2021	6/30/2022	Installation complete

Task #	Task Title	Key Person	Planned Start Date	Planned End Date	Completion Benchmark
8.2	Installation of Management Measure: Contour wire and brush lines	Connie Maxwell working with contractors	4/15/2021	6/30/2022	Initial installation complete; adjustment as needed in subsequent years
8.3	Installation of Management Measure: Microcatchments	Connie Maxwell working with contractors	4/15/2021	6/30/2022	Initial installation complete; adjustment as needed in subsequent years
8.4	Installation of Management Measure: Native grass seeding	Connie Maxwell working with contractors	4/15/2021	6/30/2022	Initial installation complete; adjustment as needed in subsequent years
8.5	Installation of Management Measure: One-rock dams	Connie Maxwell working with contractors	4/15/2021	6/30/2022	Initial installation complete; adjustment as needed in subsequent years
8.6	Installation of Management Measure: Protection of treated areas from grazing	Connie Maxwell working with contractors	4/15/2021	6/30/2022	Initial installation complete; adjustment as needed in subsequent years
8.7	Installation and completion of Management Measure: Education and Outreach, (including workshop that achieves road restoration)	Connie Maxwell working with contractors	4/15/2021	6/30/2023	Initial workshop installation complete with other measures; education conducted throughout project ending with Task 13
9	Construction oversight (supervision of installation to set quality standards)	Chuck Caruso	4/15/2021	12/1/2021	Installation complete, tested, and installation standards documented, and

Task #	Task Title	Key Person	Planned Start Date	Planned End Date	Completion Benchmark
					contractor work approved
10	Installation of monitoring equipment (project and control arroyo)	Connie Maxwell with students	4/15/2021	7/1/2021	Installation complete, tested, and data standards documented
11	*E. coli* data collection and analysis (monsoon season of highest interest)	Geoffrey Smith with students	Each year 7/1	Each year 12/1	Data documented and correlated to indicators and analysis complete
12	Hydrologic data collection and hydrologic and erosion analysis	J. Phillip King with Connie Maxwell	Each year 7/1	Each year 12/1	Data documented and correlated to indicators and analysis complete
13	Key findings recorded for future Rincon Arroyo restoration plan	Connie Maxwell	10/31/2021	6/30/2023	Results correlated between indicators and benefits

Task #	Task Title	Task Description
1	Project management and reporting	Time duration description: Assuming the project begins 7/1/2020 (acceptable to team if project is awarded later), this activity duration is over the course of the project. Task description: Oversight of the approved project including: administering contracts; ensuring technical viability of the project; ensuring funds expended are within the budget and in accordance with applicable law; and ensuring that quarterly fiscal and technical progress reports, and a final report, are submitted to NMED
2	Steering Committee	This task is over the duration of the project. Task description: meet quarterly, conduct field trips to assess the restoration implementation, results, and potential benefits and synthesize generalizable indicators that allow for estimation of extent of restoration required to achieve goals in the region. The stakeholder group will be assessing this in the context of a near-future planned project to restore the remaining Rincon Arroyo with NRCS funding.

3	Bid survey work & restoration work	The task duration is anticipated to be approximately 4 months. Surveys will bid and contracted first to provide the quantity counts and locations for the restoration work. This information will be supplied to the bidders for the restoration work.
4	BLM required clearances	The task duration is anticipated to be complete to enable installation prior to the monsoon season. BLM will complete the Programmatic Environmental Assessment for the larger Rincon Watershed Stabilization Strategy, and this will facilitate site specific NEPA and Bureau policy requirements in this project area
5	ACOE permits	The task duration is anticipated to be approximately 4 months. The team will meet with the ACOE to present the project and secure any required Nationwide (404) permits
6	QAPP for environmental monitoring and modeling	The task duration is anticipated to be approximately 2 months.
7	Vegetation cover data collection and analysis	The task duration is anticipated to be approximately 4 months each year with the vegetation monitoring itself conducted at the height of productivity, approximately each September.
8.1	Installation of Management Measure: Stone Lines	The initial installation will be complete prior to the monsoon season, 7/1/2021 (technically 7/15 so with a 2-week cushion). We will target an early start date of 4/15/2021 to accommodate unforeseen delays. After the monsoon season is complete, the contractor will return for a 3 week adaptive management adjustment period, to be complete approx. no later than June 30, 2022.
8.2	Installation of Management Measure: Contour wire and brush lines	Same description as 8.1
8.3	Installation of Management Measure: Microcatchments	Same description as 8.1
8.4	Installation of Management Measure: Native grass seeding	Same description as 8.1
8.5	Installation of Management Measure: One-rock dams	Same description as 8.1

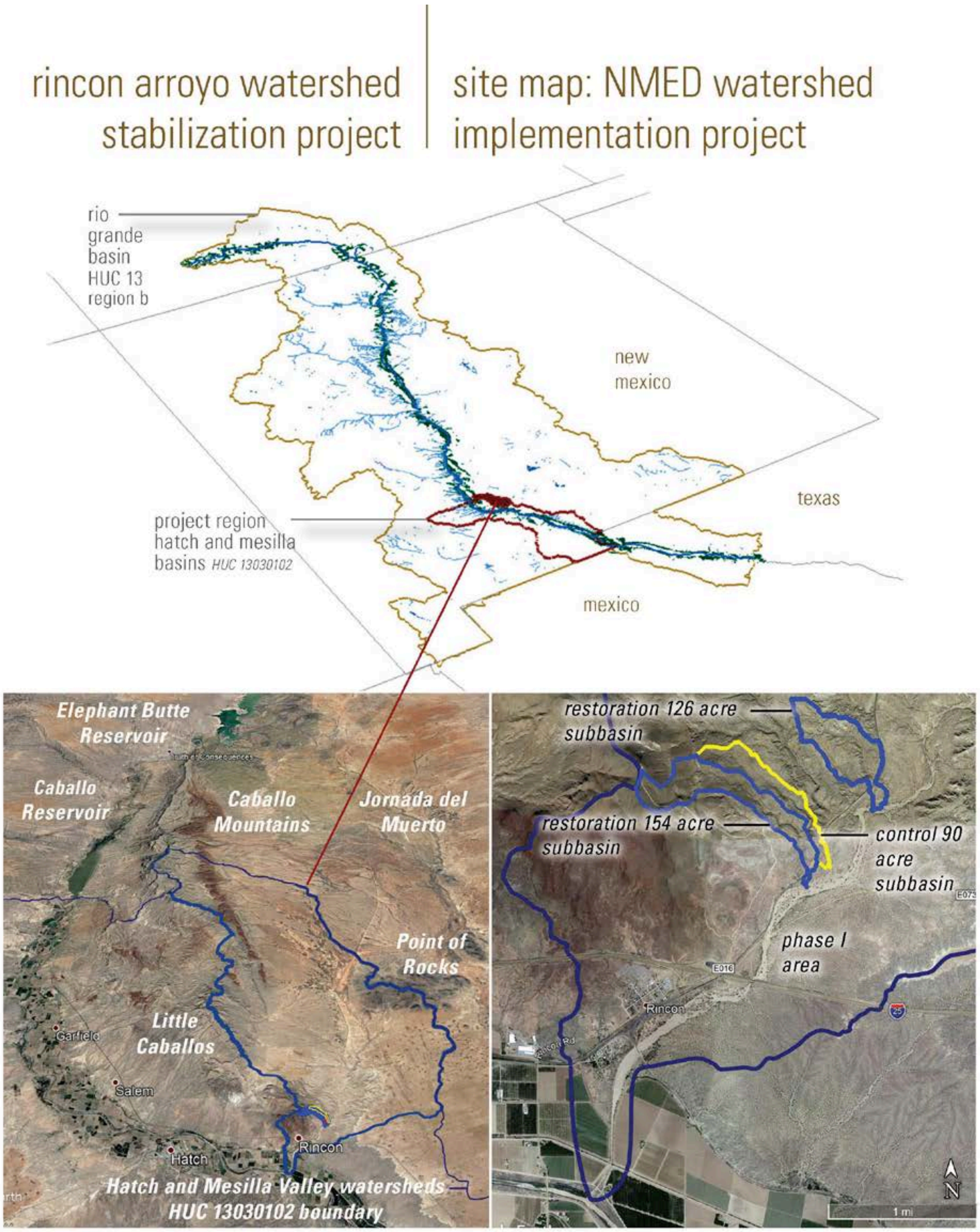
8.6	Installation of Management Measure: Protection of treated areas from grazing	Same description as 8.1
8.7	Installation and completion of Management Measure: Education and Outreach, (including workshop that achieves road restoration)	Same description as 8.1
9	Construction oversight (supervision of installation to set quality standards)	1st week of installation and review after monsoonal season runs.
10	Installation of monitoring equipment (project and control arroyo)	NMWRRI with subject experts and students will install the equipment prior to the restoration completion date
11	*E. coli* data collection and analysis (monsoon season of highest interest)	Dr. Geoffrey Smith and students to check equipment and process samples in conformance with QAPP.
12	Hydrologic data collection and hydrologic and erosion analysis	NMWRRI with subject experts and students
13	Key findings recorded for future Rincon Arroyo restoration plan	Co-production between team and stakeholders of synthesis report generalizable for the region

P. Budget

NMED WATERSHED IMPLEMENTATION GRANT						
BUDGET CATEGORIES	COMPUTATION		Unit	TOTAL COST	CWA 319 Funds	MATCH, Cash or In-
	$/Unit	Qnty				
Personnel		*subtotal->*		*$ 159,763.00*	*$ 99,477.80*	*$ 60,285.20*
Project Manager: Sam Fernald with administrative support from NM WRRI (0.04 FTE, Professor of Watershed Management and Director)	$ 65.36	225	hrs	$ 14,706.00	$ 14,706.00	$ -
Key Person: Connie Maxwell, Project Leader, assessment of results, including hydrologic modeling, and project management with Dr. Fernald (0.20 FTE, Post Doctoral Applied Researcher)	$ 25.00	1,225	hrs	$ 30,625.00	$ 30,625.00	$ -
Key person: Geoffrey Smith, Biologist results assessment and testing of samples (0.01 FTE, Professor of Biology)	$ 47.61	36	hrs	$ 1,714.00		$ 1,714.00
NMWRRI Graduate Assistant (YR 1 - 3 - 0.09 FTE)	$ 23.29	562	hrs	$ 13,089.00	$ 6,937.00	$ 6,152.00
Community Hydrology Graduate Asst. (YR 1 - 3 - 0.5 FTE)	$ 23.29	3,120	hrs	$ 72,665.00	$ 29,066.00	$ 43,599.00
NM WRRI Graduate Assistant Healthcare for 42 mos @ $200/month.This will be distributed for 6 months to NM WRRI GA and 36 months to Community Hydrology GA.	$ 200.00	42		$ 8,400.00	$ 3,516.00	$ 4,884.00
Fringe, 37.5% for Staff and 0.98% for Graduate Students				$ 18,564.00	$ 14,627.80	$ 3,936.20
TRAVEL		*subtotal->*		$ 3,680.00	$ 3,680.00	$ -
Mileage - 80 roundtrips of 80 miles ea. trip	$ 0.575	6,400	m	$ 3,680.00	$ 3,680.00	
SUPPLIES/MATERIALS		*subtotal->*		$ 83,326.00	$ 50,876.00	$ 32,450.00
Data: 1m DEM datasets for 2010, 2014, and 2018 for the Rincon Arroyo watershed (134 sq. miles)	$ 55.00	390	m2	$ 21,450.00		$ 21,450.00
Water quality - turbidity monitoring - Teledyne ISCO Avalanche Composite Sampler (price includes accessories for sampler under $5,000)	$ 5,500	3	ea.	$ 16,500.00	$ 5,500.00	$ 11,000.00
Seed and protection for revegetation areas, various grasses native to area (1 lb. bags)		30	ea.	$ 584.00	$ 584.00	
Fence for cattle exclosure - 3-wire, t-post, 2 barbed wire, bottom smooth		39,448	ft.	$ 20,522.00	$ 20,522.00	
Flow stage monitoring		4	ea.	$ 2,980.00	$ 2,980.00	
Infitration (temperature) monitors and dataloggers				$ 13,920.00	$ 13,920.00	
Staff gauge with wildlife cameras (8 ea.)		8	ea.	$ 1,320.00	$ 1,320.00	
Rain gauge - data logger, radio, standpipe, tipping bucket, soil moisture		1	ea.	$ 4,950.00	$ 4,950.00	
Water testing misc supplies	$ 500.00	1	ea.	$ 500.00	$ 500.00	
Soil testing misc supplies	$ 350.00	1	ea.	$ 350.00	$ 350.00	
Miscellaneous supplies for vegetation surveys	$ 250.00	1	ea.	$ 250.00	$ 250.00	
CONTRACTUAL/ CONSTRUCTION				$ 247,149.00	$ 189,649.00	$ 57,500.00
Consultant/Contr - 1. King Engineering & Associates, Inc.		*subtotal->*		*$ 9,000.00*	*$ 7,500.00*	*$ 1,500.00*
Hydrologic modeling supervision and assessment *(20 hours match)*	$ 75.00	120	hrs	$ 9,000.00	$ 7,500.00	*$ 1,500.00*

Consultant/Contr - 2. Chuck Caruso		*subtotal->*		*$ 8,299.00*	*$ 8,299.00*	*$ -*
Restoration bidding and installation advising and supervision	$ 80.04	80	hrs	$ 6,403.00	$ 6,403.00	
Travel - 3 trips from Alb - 552 miles and 5 roundtrips of 80 miles ea trip from Las Cruces (2056 miles), GSA raes for 4 nights per diem (lodging), 7 days per diem (M&IE - $41.25 1st & last day of travel, $55 others)				$ 1,896.00	$ 1,896.00	
Consultant/Contr - 3. Survey for installations - to be bid		*subtotal->*		*$ 3,202.00*	*$ 3,202.00*	*$ -*
Contour layouts with stakes driven	$ 80.04	40	hrs	$ 3,202.00	$ 3,202.00	
Consultant/Contr - 4. Management measures installer - to be bid - approx. 18 weeks installation, 4 weeks installation adjustments		*subtotal->*		*$ 219,591.00*	*$ 163,591.00*	*$ 56,000.00*
Contractor labor in-kind match (difference between the dollar value of volunteer time and the corpsmember pay)				$ 56,000.00		$ 56,000.00
Personnel & Fringe				$ 123,071.00	$ 123,071.00	
Travel				$ 27,722.00	$ 27,722.00	
Equipment - Delivery of supplies				$ 1,263.00	$ 1,263.00	
Supplies/Materials: stone for contour stone lines, posts and net wire for net-wire fences				$ 11,535.00	$ 11,535.00	
Consultant/Contr - 5. Road work and workshop		*subtotal->*		*$ 7,057.00*	*$ 7,057.00*	*$ -*
Personnel & Fringe: workshop, site analysis, preparation	$ 80.04	75	hrs	$ 6,000.00	$ 6,000.00	
Travel - $0.60/mile roundtrip from Pojoaque, NM to Rincon, NM (268 miles), per diem $60/day, 4 days				$ 562.00	$ 562.00	
Equipment, workshop uses existing maintenance crew				$ -	$ -	
Supplies/Materials, staking and workshop materials				$ 495.00	$ 495.00	
Consultant/Contr - 6. Technical consultant		*subtotal->*		*$ 8,004.00*	*$ 1,601.00*	*$ 6,403.00*
Chris Canavan, Blue Heron Enterprises	$ 80.04	100	hrs	$ 8,004.00	$ 1,601.00	$ 6,403.00
Other		*subtotal->*		*$ 30,352.00*	*$ 14,018.00*	*$ 16,334.00*
Tuition/Scholarship $329.20/credit @ 9 credits/semester for 1 graduate assistant (working on this project)	$ 329.20	18	$3	$ 17,777.00	$ 14,018.00	$ 3,759.00
Steering Committee and project advisement (Non-federal match), John Gwynne, DACFC ($78.39/hr), Zachary Libbin, EBID ($58/hr), Susie Downs, CSWCD ($25/hr)		162	hrs	$ 8,715.00	$ -	$ 8,715.00
Stormwater Coalition and other non-fed collaborators (attend meetings, field visits, and volunteer activities on project, including two EBID employees joining installation for one week, and DACFC installing rain gauge, maintaining, and tying into system)	$ 25.00	134	hrs	$ 3,860.00	$ -	$ 3,860.00
SUBTOTALS AND INDIRECT COSTS						
TOTAL DIRECT COSTS				*$ 532,274.00*	*$ 359,301.80*	*$ 172,972.20*
Modified Total direct Costs (MTDC)				*$ 497,997.00*	*$ 339,784.00*	*$ 158,213.00*
Foregone indirect costs				*$ 74,152.00*		*$ 74,152.00*
INDIRECT COSTS for admin. support (not to exceed 10% of funding requested)				*$ 55,327.00*	*$ 37,750.00*	*$ 17,577.00*
TOTAL PROJECT COSTS				$ 661,753.00	$ 397,051.80	$ 264,701.20

Q. Project Area Map



New Mexico Water Resources Research Institute
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