Regions of New Mexico with Acequia Water Distribution Systems: Tools to Adapt to Water Scarcity and Guide Implementation of Strategies to Increase Acequia Community and Water Resilience

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# Technical Proposal and Evaluation Criteria

# 1 Executive summary

# Date: June 15, 2022

*Applicant:* New Mexico Acequia Association (NMAA), 805 Early Street # B203, Santa Fe, NM 87505

*Applicant Categories:* NMAA is a Category B applicant in partnerships with entities that have water delivery authority to acequias. The NMAA advocates to "protect water and our acequias," which are systems of mutually managed irrigation channels that in New Mexico total close to 700 acequias (Arellano, 2014; NMAA, 2019). Category A applicants include the Pojoaque Valley Irrigation District and Santa Cruz Irrigation District and regional acequia associations that include as their members dozens of acequias with water distribution authority to their respective members including Rio de Chama Acequia Association; La Associacion de las Acequias Norteñas de Rio Arriba; Taos Valley Acequia Association; Rio Quemado, Rio Frijoles, Rio en Medio, and Rio Santa Cruz Stream Systems' Community Ditch Association (The Association); Las Nueve Acequias; North Farmington Ditch; Farmers Mutual Community Ditch; and the State of New Mexico's Interstate Stream Commission.

*Executive summary:* The New Mexico Acequia Association, a grassroots, statewide federation of acequias and regional acequia associations, in partnership with irrigation districts, regional acequia associations, and individual acequias and assisted by the New Mexico Water Resources Research Institute, proposes to lead an effort to develop water budget modeling tools that facilitate the creation and implementation of flexible water sharing and resilience strategies focused on the Northern Rio Grande and San Juan Basins of New Mexico (Figure 1). While the focus of the effort is to increase resilience in acequia communities, the team recognizes that this requires collaboration with all water users that affect the water supply in the regions. The team proposes to convene regional working groups of water users, policy makers, agency stakeholders, and scientists to collaboratively develop water budget models integrated with water and community resilience indicators and identify triggers for drought mitigation management, actions, and responses.

Our proposed objectives include:

- 1. Assess lessons learned from existing acequia water sharing agreements and traditional water sharing practices and integrate with stakeholder-driven strategies identified in this project and previously collected for drought mitigation and responses that support water and agricultural resilience
- 2. Estimate the extent of alternative regional water management strategies in the face of drought that can achieve regional water management goals, and evaluate the effects of the strategies through:
  - using decision support tools for the Northern Rio Grande and San Juan Basins of New Mexico that will be adapted from a currently built models for the Southern and Northern NM Rio Grande Regions (Figure 1)
  - integrating into regional decision-support models the variety of regional data sources, model inputs, drought indicators, and factors that indicate protection of water quality and quantity for the environment, agriculture, and communities
- 3. Integrate drought mitigation and response actions into regional water management and the regional planning frameworks through the identification of triggers for

implementation of various strategies including complementary programs in wildfire response, rural water providers, and forest, range, and farmland management.

- 4. Make these tools available online for water users, policy makers, and resource advocates.
- 5. Analyze suitability of the San Juan and Northern NM Rio Grande region tools for other similar regions with acequias including the Pecos River Basin, the Canadian River Basin, and the Gila River Basin by interactions with stakeholder representatives and statewide representatives from these regions, laying the groundwork for tool availability to all 5 major river basins of New Mexico.

Acequias and traditional agriculture provide many drought mitigation and ecosystem service benefits for the larger community, from aquifer recharge to habitat for migrating birds, and neither these benefits nor the strategies to protect these benefits are often well understood. This project aims to identify these strategies, quantify these benefits, and provide a roadmap to regional agriculture and water resilience.

#### Project Timeline: April 1, 2023 to March 31, 2026

*Federal Facility:* Regions include Reclamation reservoirs of Heron, El Vado, Nambe Falls, Navajo Lake, Sumner and Fort Sumner Diversion, Brantley, and Avalon in and upstream source

of waters for Elephant Butte and Caballo Reservoirs, and the Mesilla Diversion; Bureau of Land Management, and National Forest Service property jurisdictions.

# 2 Project Location

The decision support tools to be fully developed are for the regions of Northern Rio Grande (NRG) and San Juan (SJ) Basins of New Mexico, and the team will lay the groundwork for tool availability for all 5 New Mexico major river basins (**Figure 1**).

# 3 Technical Project Description



**Figure 1.** The decision support tools for the (NM) Northern Rio Grande (NRG) and San Juan (SJ) Basins of New Mexico (shown in dark red outlines) will be adapted from currently built models for the NM's NRG and LRG Regions (shown in orange shading). These tools will also be analyzed for suitability and lay the groundwork for tool development for the remaining basins in New Mexico, the Pecos River Basin, the Canadian River Basin, and the Gila River Basin.

3.1 Task C—Projects to Improve Water Management through Decision Support Tools, Modeling, and Measurement

This proposed project focuses upon development of water budget modeling decision-support tools to improve water management.

3.1.1 Developing water management and modeling tools to help communities evaluate options and implement strategies to address drought

# 3.1.1.1 Goal

Our goal is to develop online decision-support water budget modeling tools to facilitate the creation and implementation of flexible water sharing and resilience strategies in the face of drought for the Northern Rio Grande and San Juan Basins of New Mexico, as well as the

foundation to extend these tools to the remaining basins in New Mexico. Acequias and traditional agriculture provide many drought mitigation and ecosystem service benefits for the larger community, from aquifer recharge to habitat for migrating birds, and neither these benefits nor the strategies to protect these benefits are often well understood. This project aims to identify these strategies, quantify these benefits, and provide a roadmap to regional agricultural community and water resilience in the face of drought.

### 3.1.1.2 Working groups

The team proposes to convene regional working groups of water users, policy makers, agency stakeholders, and scientists to collaboratively develop water budget models integrated with water and community resilience indicators and identify triggers for drought mitigation actions and drought responses. The team, project partners outlined in the Executive Summary and advisory group will assist in identifying and inviting relevant upstream and downstream users that would benefit from collaboration with acequia communities. This includes Tribes, Pueblos, Counties, Municipalities, Public Water Systems and Water User Associations. The stakeholders involved in the regional focus groups, workshops, and interviews described in section 3.1.1.5 form the leadership of the proposed working groups. See Addendum 3 for a table of initially anticipated working group invitees.

<u>Project team leadership</u>: New Mexico Acequia Association (NMAA); New Mexico Water Resources Research Institute (NM WRRI); NM WRRI's Water and Community Collaboration Lab (WCC-Lab); New Mexico Interstate Stream Commission (NM ISC); New Mexico Department of Agriculture; <u>Advisory Group</u>: Team leadership; Partners; David DuBois, NMSU State Climatologist and chair of the NM Drought Monitoring Work Group; Don Bustos, Chair, Santa Cruz Stream Association, Santa Cruz Farms; Darel Madrid, President, Rio de Chama Acequia Association, Inc.; Alfredo Montoya, Commissioner, Acequia Madre Alcalde; Myron Armijo, Tribal Liaison, State of New Mexico; Allan C. Walraven, Farmers Mutual Community Ditch; Stacy Timmons, Water Data Initiative; Martha Graham, New Mexico Rural Water Association; Saeed Langarudi, previous Assistant Research Professor at NMSU and collaborating modeling advisor

# 3.1.1.3 Objective 1: Assess lessons learned from existing water sharing agreements and integrate with previously collected stakeholder-driven strategies for drought mitigation and responses that support water and agricultural resilience.

While the tradition of reparitmento or water sharing is ancient, in modern times these agreements have been codified in writing, sometimes independently by acequia leaders, at other times with the assistance of the NMAA, or on occasion through the Office of the State Engineer. The NMAA receives numerous requests for assistance addressing water sharing concerns and drought conditions have created a need to increase our capacity to meet these requests. We have identified water sharing agreements as an essential strategy to maintain resilience in the face of drought.

A pivotal step to support more acequia communities in adapting water sharing agreements is to formulate a template water sharing agreement with a variety of options to fit the needs of each specific situation. The template agreement must also be accompanied by an outline of the process to support communities in evaluating how to create and implement a customized water sharing agreement and guide the team supporting the community leaders. To create this template and process guide we will first document existing water sharing agreements to evaluate process of creating them, lessons learned, effectiveness, outcomes, including the consequences, of various approaches. This would include specifying various components of water sharing agreements and looking at what aspects might be unique to serving distinct situations. Additionally, we will consider including options that are not currently in practice but may be helpful to acequias in facilitating water sharing. The working groups in this project will support the collection of Community Needs Assessments, to gather information from communities without water sharing agreements about their current issues, concerns, solutions and ideal outcomes. To develop new community water-sharing agreements that meet an acute need to build water security in local areas threatened by water scarcity and conflict, we will:

- Build and deploy a multidisciplinary technical team to conduct outreach, interview, and data gathering to document information about water-sharing agreements that represent some examples of inter-acequia water sharing and acequia-with other entities water sharing. We will document and learn from case studies of existing water sharing through storytelling, interviews, and summaries of technical details as well as copies of the actual written agreements.
- Create, distribute and review a community needs assessment to prioritize what communities need immediate water sharing agreement assistance.
- Build and deploy a multidisciplinary technical team to respond to pending requests for assistance with water sharing. Members of the team would work closely with local leaders to gather data and information about the conditions (water supply and needs, acequia governance assessment, etc.) and about the conflicts that gave rise to the need for a water sharing agreement.
- Where the team and local leaders have an understanding on how to proceed, the technical team can assist local leaders developing new water-sharing agreements by offering consultation in water policy, acequia customs, or hydrology as well as mediation services where needed.

# 3.1.1.4 Objective 2: Estimate the extent of alternative regional water management strategies in the face of drought that can achieve regional water management goals, and evaluate the effects of the strategies.

To test the stakeholder identified drought mitigation and alternative water management strategies, our team will develop decision support tools for the NRG and SJ Basins of New Mexico that will be adapted from a currently built models for the Southern and Northern NM Rio Grande Regions (A. Fernald et al., 2012; Langarudi, Maxwell, Bai, Hanson, & Fernald, 2019; Langarudi, Maxwell, & Fernald, 2021; Peterson, Hanson, Roach, Randall, & Thomson, 2019). We will integrate into regional decision-support models the variety of regional data sources, model inputs, drought indicators, and factors that indicate protection of water quality and quantity for the environment, agriculture, and communities

The decision support tools to estimate potential management strategies will be water budget models, online interface tools, and a handbook that describes the alternative strategies proposed by stakeholders and the results of the estimates of the benefits. Water budget models are tools used by water users and managers to quantify the hydrological cycle. A water budget is an accounting of the rates of water movement and the change in water storage in all or parts of the atmosphere, land surface, and subsurface (Healy, Winter, LaBaugh, & Franke, 2007), and is a critical tool to predict the comparative effects of differing scenarios that comprise Regions of New Mexico with Acequia Water Distribution Systems: Tools to Adapt to Water Scarcity and Guide Implementation of Strategies to Increase Acequia Community and Water Resilience

combinations of strategies (**Figure 2**). A

comprehensive water budget considers in its conceptual model the mutual connections and feedbacks between all these components.

The collaborating team and stakeholders will develop the model framework to test and compare future scenarios, and add or revise data as necessary. Trends from the model will inform the triggers for mitigation and response actions.

The water budget models will utilize data as



**Figure 2.** Predictive scenarios are critical to estimate effects of strategies to address projected climate challenges, and require a water budget assessment to understand the regional dynamics.

inputs from NM WRRI's New Mexico Statewide Dynamic Water Budget (DSWB). NMWRRI led a statewide team to develop a hydrology system dynamics simulation model that deploys a water balance approach to characterize historical behavior and predict future trends of New Mexico's water resources with a historical period of the model based on data from 1975 – 2018, and a future period from 2019-2099. Four sectors can be currently tested with alternative scenarios: climate change, population growth, water use efficiency, and agricultural land acreage. For climate change, future temperature, precipitation, and streamflow estimates in the DSWB are derived from one of four separate General Circulation Model runs that span three different greenhouse gas (GHG) emissions climate change scenarios: low emissions (NCAR), moderate emissions (UKMO), high emissions (GFDL), high emissions (MPIM).

The NM WRRI team has begun to develop DSWB Regional Water and Community (RegWaC) models due to each region having unique dynamics, as well additional indicators are required to assess overall system resiliency. The models for the two regions of focus will be adapted from two existing model efforts: a DSWB RegWaC model for the southern New Mexico Lower Rio Grande (LRG) water planning region (WPR), and a suite of models developed for acequia resilience.

The LRG model was created and is being further developed in a project supported by NMSU Cooperative Agreement with Reclamation (Grant No. R16AC00002), and is being further developed as a drought mitigation decision support tool in another project under this Reclamation Drought Resiliency Program (Grant No. R21AP10035). This proposed project benefits from this critical initial work, and furthers the stated-goals of NMSU Cooperative Agreement project for the development of the ability for these regional models to be scalable and transferable. As we develop the NRG and SJ Basin DSWB RegWaC models, we will identify the protocol for the optimum process to transfer and adapt models to different regions. An important component will be the incorporation of the ability to nest more detailed submodels in the larger regional model. This will allow for the integration of data that is available and collected on

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different scales, and models that can be customized to the specific management challenges identified by the stakeholders. The process begins with identification of the boundaries that drive water availability and management decisions, a selection of which can be seen in Figure 3. This includes management authority boundaries, surface drainage basin boundaries, and aquifer basin boundaries that support developing mutual understandings of often complicated water management scenarios. Identifying potential management alternatives also requires the integration of available socio-demographic data from communities and hydrological data from observation, which were significant drivers of the socio-hydrologic processes portrayed by the LRG DSWB RegWac model. The team's approach for DSWB RegWaC models is to work closely with community inputs to and expand the portfolio of socioeconomic data used in modeling and result in a powerful facility to support the development of resilience. These modeling approaches assist in the application of water and community data in a systematic methodology resulting in a model that serves as a community toolkit with accessible data and comprehensible information. The DSWB RegWac technique reveals the underlying critical dynamics of the large extent of considerations and accessible data for management issues for a specific site, resulting in a practical and realistically created decision-making tool.

The LRG DSWB RegWaC model effectively currently measures the relationships between water demand, water availability, and water supply as climate and society changes in a human managed area by integrating hydrologic and socioeconomic elements with system dynamics models (Bai, Langarudi, & Fernald, 2021; Langarudi et al., 2019). The LRG DSWB RegWaC model also effectively incorporated socioeconomic and hydrologic inputs to capture the dynamics between human activities and management mechanisms. The acequia resilience models in Northern NM Rio Grande Region demonstrated that hydrologic connectivity and

community connectivity are interlinked and each supports the resilience and health of the other; provided insights on the interactions between irrigation water, and grazing land; and developed a model to allow simulations of changes in human and natural systems linked by acequia communities. Research using this suite of models has documented how the acequia systems support the natural systems and the riparian functions of the valleys through their diversion of river flows to unlined ditches and spread onto fields



**Figure 3.** Locations of irrigated agriculture in the NM Northern Rio Grande (NRG) and San Juan (SJ) Basins in relation to selected hydrologic and managerial boundaries that will inform the development of the decision-support models, the DSWB Regional Water and Community (RegWaC) models.

resulting in recharge of groundwater as overbank flooding did prior to agricultural development (A. G. Fernald, Baker, & Guldan, 2007; Gutiérrez-Jurado, Fernald, Guldan, & Ochoa, 2017; C. G. Ochoa et al., 2013). The water balance component is robust, the NM WRRI team used a systematic approach to predict surface water routing for acequias of NM's Northern. Extensive field experiments in the Rio Hondo region conducted during and subsequent to the development of the acequia resilience models provide keystone measures for many of the hydrologic processes such as recharge (L. Conrad, Fernald, Ochoa, & Taylor, 2020; L. M. Conrad, Fernald, Guldan, & Ochoa, 2022; Cruz, Fernald, VanLeeuwen, Guldan, & Ochoa, 2019; Gutiérrez-Jurado et al., 2017; C. Ochoa, Guldan, & Fernald, 2020). The acequia surface water hydrology models yielded accurate scientific results to track the effects of climate change on local water supply in headwater areas (Bai, Fernald, Tidwell, & Gunda, 2019; Turner et al., 2016). The acequia surface water hydrology models have a compact size and accurately characterize precipitation-runoff dynamics.

# *3.1.1.5 Objective 3: Integrate drought mitigation and response actions into regional water management and the regional planning frameworks*

The New Mexico water planning entity, the Interstate Stream Commission (ISC), in coordination with the water regulatory agency, the Office of the State Engineer, conduct statewide and regional water planning efforts (NM OSE and ISC). Our team includes ISC collaboration to facilitate plan integration of triggers for implementation of strategies identified by this project and complementary programs in wildfire response, rural water providers, and forest, range, and farmland management. The ISC is currently undergoing a statewide 50-year water planning effort, for which NM WRRI collected regional stakeholder issues, strategies, and visions for the future (Maxwell et al., 2022). This effort built a foundation for this proposed project, where the stakeholders involved form the leadership of the working groups. Eleven events of focus groups, workshops, and interviews were conducted with stakeholders from Tribes and Pueblos and five New Mexico regions with a diversity of climatic and water conditions.

# 3.1.1.6 Objective 4: Make these tools available online for water users, policy makers, and resource advocates

The decision support tools will include the development of an online application of the model that allows stakeholders to compare competing management strategies of critical resources within the planning area. This would help to identify, evaluate, and prioritize mitigation strategies that will build long-term resiliency to drought. Users will be able to change parameters on the online interface without the need for any previous modeling experience. Demonstration and collaborative review of this method would occur in the working groups, so that users that lack access or are uncomfortable with computers can run these scenarios and have small group discussions. These regional models are extensions of the DSWB, and will be located at that online location. The latest version can be found at (https://nmwrri.nmsu.edu/new-mexico-dynamic-statewide-water-budget-beta-version-3-0/). The DSWB can used to describe, analyze, and assess water situations and drought in New Mexico to easily provide water data to stakeholders, water managers, and planners to make water resources management decisions.

#### 3.1.1.7 Objective 5: Analyze decision support tool suitability for other similar acequias regions

Our team will analyze the suitability of the NRG and SJ region tools for other similar regions with acequias including the Pecos River Basin, The Canadian River Basin, and the Gila River Basin. Upon substantiating the adaption of the existing DSWB RegWaC models for the two new regions and establishing the transference protocol as described above in section 3.1.1.4, we will

then convene regional working groups with stakeholder representatives from regions of these basins with acequias and statewide representatives. This will lay the groundwater for tool availability to all 5 major river basins of New Mexico.

# 4 Performance Measures

The team and the advisory board will assess and execute the monitoring and evaluation plan tracking milestones achieved and outputs completed as outlined in the project timeline in Section 5.5.1. Each component of the project is both reviewed and the outputs tested with the working groups in the annual workshops, which will provide assessments of the outputs and recommendations for revisions. The team will review and incorporate the workshop recommendations and complete annual evaluations of the progress of the project to present the results to the advisory board in annual meetings.

Performance measures of the alternative scenarios to mitigate drought and meet stakeholder goals will be the quantitative or qualitative results of the effects upon mutually agreed-upon critical and useful indicators from alternative scenarios of water management, including potential and executed water sharing agreements. Indicators previously identified by stakeholders (in the regional focus groups, workshops, and interviews described in section 3.1.1.5) will be reviewed with the working groups and currently include the major components of the water budget, e.g. recharge, surface water availability quantities, timing, and distribution; major ecosystem services, such as productivity and watershed health that can mitigate fires and flooding; and community resilience indicators, such as livelihood.

# 5 Evaluation criteria

# 5.1 Evaluation Criterion A — Project Benefits (30 points)

# 5.1.1 How will the project build long-term resilience to drought? How many years will the project continue to provide benefits?

Long-term drought resiliency for New Mexico requires the recognition of a need to adapt to a new normal - a permanent shift to a more arid climate (Dr. Phil King personal comm.). This project will support regional water managers' identified need to develop management strategies to make this shift, and use the wetter years to serve to restore water storage stocks and build the buffers to drought through increasing overall system health on watershed and aquifer scales. The ability to measure the effects of alternative scenarios, which characterize different combinations of alternative management strategies, is critical to be able to implement management that optimizes the water dynamics that benefit the community goals. Previous work with stakeholders in the NRG Basin proposed strategies that will be needed for overall resilience (**Figure 4**). At one of the workshops, Don Bustos (on the advisory board for this proposed project) shared the below, which summarizes key components of strategies that need to be assessed.

I heard that our growing season is going to change tremendously. And by 2050, which is only like 27 years from now we're going to be growing in the same conditions maybe as Phoenix, Arizona. How do we start to adapt our plants? What kind of food are we going to be growing in those conditions? What are the seasons going to look like? Our season's going to be more from maybe January to March, April, May, and then in the hot time, a couple of months, we don't grow anymore. We have to prepare for those types of changes, addressing the climate change needs. For the crop growing seasons, it is important to know how much water the specific crop is going to be used. So we get the right adequate amount of water to those crops. So, there's a lot of things that I think could be really important around our crop

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research and understanding what climate change is going to do to our growing and how we're going to be able to make enough money to pay the bills. What's the economic impact going to be in the future related to climate change in crop production? What are some of the high value crops, I know there's a lot of success around lavender, but there's going to be

Figure 4. Stakeholder management strategies proposed to be needed for system resilience.

a lot of other crops. Could we explore and develop a lot of herbs, or make remedies, or traditional kind of remedios. And then technology, we have to be able to incorporate technology.

To be able to grow food with the least amount of water, but also be able to use that efficiently so that we can continue to recharge the aquifers, create these natural habitats for the pollinators and all the living creatures. So it's not only about the technology, which is there, but how do we blend that with needs for traditional and cultural appropriate types of growing methods? So we're trying to blend traditional knowledge with modern research and science and create a language and programs that benefit the whole community. The other piece I wanted to mention before I end is that this is totally about community engagement. I think for it to be successful and to be embraced for future people and generations, it has to come from the people that are in those regions and it has to be homegrown so that people own it. And we really want to save our watersheds. So to me, it's about the community engagement piece about the research and blending, traditional culture and knowledge with all the appropriate activities that are occurring.

This project will have long-term benefits to the regions, as the results from comparing scenarios holds value even if base conditions change. The decision-support tool can maintain its full value perpetually if data inputs are maintained, and increase in value if results of ground measures of effects of alternative management are updated in the model.

5.1.2 Will the project improve the management of water supplies (e.g. increase efficiency, operational flexibility, or facilitate water marketing)? Much of this will be through the project making, what new information will be made available to water managers, and how will it improve water management? What would the estimated quantity be, how calculated, and what percentage of the total water supply does the managed water represent?

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This project will support the development of regional collaborative partnerships that will improve mutual understandings of the dynamics of water and the effects of alternative management approaches on the regional scales. The new information will provide qualitative and quantitative measures as to the extent of these strategies required to mitigate drought and achieve stakeholder goals. For example, harnessing monsoonal flood flows is a critical strategy throughout the state to mitigate water scarcity. An example scenario is shown in **Figure 5**, where the drier parts of the landscape could remain under cultivation through using crops and practices with low water needs and taking advantage of monsoonal flows.



**Figure 5**. Plans to mitigate drought effects under discussion with stakeholders include strategies to optimize use of surface waters for maximizing cultivation using crops and practices with low water needs. Shown here are potential strategies of harnessing monsoonal flood flows and providing farm storage to adapt to earlier spring runoff and utilize winter flows for fall and winter cropping. Plans of the potential land strategies will be collaboratively developed and reviewed with the working groups, and used to derive measures to estimate the strategies in the decision-support models, the DSWB Regional Water and Community (RegWaC) models.

Anticipated effects include:

- Facilitating water sharing agreements across water users to accomplish below objectives
  - Increasing efficiency and equity of water sharing across water users
  - Increasing flexibility using water sharing agreements to anticipate shortages and priority needs
  - Ensuring vital community needs are met (food production, livestock watering, ecosystem services) via above goals
- Understanding and estimated effects of potential management actions on water budget for regions, including but not limited to effects of:
  - Changes in water spreading from reduced irrigation or added aquifer recharge projects to aquifer GW levels
  - Lining of acequia madre (main ditches) to riparian areas, GW levels, and agricultural operations
  - o Impact of water transfers surface rights to subsurface rights

 Impact of water transfers off of acequias (change in place of diversion) The quantity of water supplies in the two regions that will be assessed are selectively summarized in **Table 1**. To convey the new normal, included is the average annual over the last 16 years estimated in the DSWB model, beginning at the onset of the most recent major drought period. The percentage of water supply that will be assessed will be 100%. Each water budget component is compared to the the major water management focus for acequias, which is represented by the quantities of both the diverted and consumptive use of agriculture. The other

water budget numbers give an indication of the quantities that could be managed differently. For example, looking at the NRG Basin Region, the estimated consumptive use of agriculture is less than ½ of the diversions, reflecting the significant recharge benefits of the surface spreading of agriculture. As agricultural cultivation reduces due to reduced and earlier surface water supplies (see additional description of dynamics in section 5.4), effects on groundwater levels have been

reported. Watershed-scale stormwater harvesting strategies could make use of runoff supplies (174% of agricultural diversions) and increase water availability. As is typical of arid and semi-arid regions, the vast majority of precipitation (3593% of agricultural diversions) is lost in evapotranspiration (3176% of agricultural diversions). As the uplands continue to lose soil moisture to drought, watershed restoration can mitigate the projection of increasing ET and support infiltration and aquifer recharge. In the valleys, alternative crop choices can reduce crop consumptive use and overall water demand.

The water budget elements were estimated in the NRG and SJ Basins as measured by NM WRRI's New Mexico Statewide Dynamic Water Budget (DSWB) model (Peterson et al., 2019) (**Table 1**). Surface water and groundwater diversions and diverted water for agriculture were obtained from OSE water use by categories reports (NM OSE). Agricultural depletions were estimated using the Blaney and Criddle (1950) equation. Precipitation was calculated based on monthly PRISM data (PRISM Table 1. Selected water budget components for NM's NorthernRio Grande (NRG) and San Juan (SJ) Basin Regions asmeasured by NM WRRI's New Mexico Statewide DynamicWater Budget (DSWB) model (Peterson et al., 2019).

Description	2002-	% of Water
units: historical average is 1.000 ACFT/YR	2010	Manag
% is x/Diverted Water for Ag		ed
Northern NM Rio Grande Basin Regi	on (data i	s from
the Jemez Y Sangre, Taos, and Rio	Chama W	'PR's)
Precipitation	6991	<mark>3593%</mark>
Surface Water Supplies into Region	1100	566%
Runoff	339	<b>174%</b>
Groundwater (GW) recharge (GW major uses of concern are baseflow and household consumption)	473	243%
Surface Water Diverted Water for Ag only	195	100%
Ag depletions based upon consumptive use requirements	74	38%
Surface Water diversions for Use (all categories)	372	191%
Groundwater diversions for Use (all categories)	48	25%
Evapotranspiration (Land surface)	6179	<mark>3176%</mark>
Evapotranspiration (Surface Water)	86	44%
Evapotranspiration (Human Use + GW)	199	38%
San Juan Basin Regio	on	
Precipitation	5474	4452%
Surface Water Supplies into Region	1246	1013%
Runoff	85	69%
Groundwater (GW) recharge (GW major uses of concern are baseflow and household consumption)	120	51%
Diverted Water for Ag only	123	100%
Ag depletions based upon consumptive use requirements	63	51%
Surface Water diversions for Use (all categories)	443	360%
Groundwater diversions for Use (all categories)	7	6%
Evapotranspiration (Land surface)	5269	4285%
Evapotranspiration (Surface Water)	106	86%
Evapotranspiration (Human Use + GW)	240	4285%

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Climate Group). Surface Water Supplies into region were calculated based on USGS stream gage measurements (USGS, 2015). Land surface Evapotranspiration (ET) is equal to precipitation less surface water runoff and recharge (Peterson et al., 2019). Runoff and recharge calculated as part of a closure term for the surface water system (Peterson et al., 2019). Surface Water ET is calculated as evaporation only from stream and rivers, while Groundwater ET is calculated as ET from riparian areas. Human Use Evapotranspiration is estimated as the all water consumed by the OSE water use categories. A complete description of these parameters can be found in (Peterson et al., 2019).

The efforts to build the foundation for water budgets in all basins New Mexico is an urgent need. NMWRRI conducted a review of NM water balance models as cited in the literature

and identified by the USGS New Mexico Water Science Center. The team found 26 modeling attempts aimed at quantifying water resources (Figure 6). The most common type are groundwater flow models, with most located around major urban centers in the Rio Grande basin. The USGS has recently published two models to quantify the effect of climate change on surface water. The analysis revealed that there is a gap in the knowledge of water budgets in large portions of New Mexico. The existing models only quantify a component of the water budget, in some cases for limited periods of time, and for the rest of the state there is no estimate. The DSWB fills this gap by providing information on the water budget for each county, river basin, WPR and statewide, in a historical period that goes from 1975-2018, and allows projecting future scenarios to 2099 according to different level of emissions, use of land for agriculture, population growth, and water efficiency. This project supports the extension of the DSWB to more regions, collaborating with stakeholders to craft



**Figure 6.** NM WRRI conducted an analysis of water balance models in NM, which revealed significant gaps in water budget information. NM WRRI's DSWB model addresses this gap by characterizing the water budget for the entire state with both historical data and the ability to predict the effects of scenarios to the end of the century. This project supports the extension of the DSWB to address regional needs. ©NM WRRI 2022.

useful management scenarios useful and integrate additional data needed to estimate the effects, including socio-economic data.

5.1.3 Qualitative description of the anticipated water management benefits significance/extent An important buffer to drought effects is to keep water in agricultural valleys, which is critical for resilience of the landscape's natural resource base. Future watershed health initiatives will benefit wildlife and the environment by increasing vegetation cover and address excessive erosion that can threaten habitat. An improved prediction of benefits also improves the ability to prioritize the most effective and significant projects.

# 5.1.4 New Water Marketing Tools or Program: Water Sharing Agreements

# 5.1.4.1 Overall benefits of the program and increase in flexibility

Water sharing agreements allow acequias and other entities to have agreements in place for how to share water in both times of plenty and scarcity. These agreements anticipate critical water

uses and needed flexibility to mitigate conflict and legal actions. This includes eliminating priority calls which not only leave irrigators high and dry, but also ecosystems, local wells and any other entity that depends on the recharge effects of acequias. Additionally, water sharing agreements create a greater sense of stability of what to plan for in an agricultural season.

### 5.1.4.2 Legal framework - Are there any legal issues that could hinder project implementation?

Water-sharing agreements (a.k.a. shortage-sharing agreements) and other forms of "alternative administration" do not have legal issues that could hinder project implementation. They are sanctioned under the State's Active Water Resources Management (AWRM) initiative, which was established by the state legislature in January 2004 in response to severe drought conditions. The tools for AWRM, which can be used for either priority administration or alternative administration include: measuring and metering, community input in the development of rules and regulations, creation of water districts and appointment of water masters, and development of water master manuals. The staff of the Office of the State Engineer has encouraged and facilitated shortage-sharing agreements among water users.

Alternative administration is a framework that provides for local communities to avoid priority administration and to propose an alternative solution, typically in the form of a water sharing agreement in which the parties negotiate and agree to measures such as rotation schedules, headgate management, or other methods. In New Mexico, the concept of alternative administration is consistent with long-standing community customs of water sharing.

Although the OSE has set some goals for implementation of AWRM in priority basins, the agency has not had the resources to implement projects nor to develop basin-specific or district-specific regulations in most basins in the state. While the agency has dedicated resources to supporting water sharing agreements in key areas, such as the Rio Chama, the experience has demonstrated that the assistance needed by local communities can be resource-intensive.

#### 5.1.4.2 What is the scope of water users and uses that will benefit?

There are several communities in New Mexico where water sharing agreements are in various stages of development and still other communities where there are no agreements in place but may be needed in the near future. In general, for communities to have the capacity to engage in water sharing negotiations and to develop agreements, they need resources for organizing and developing structures for decision-making. They may also need access to resources for advisors who can assist with an understanding of water law and hydrology or with navigation of any existing sources of data that can help inform the process. In some communities, access to trained mediators may be helpful in facilitating a water sharing agreement.

The OSE has created teams to address AWRM in each priority stream system (each basin team includes a project manager, hydrologist, attorney, communication manager, personnel manager, and technical support staff), but the agency does not have enough capacity to meet demand. Many communities wish to develop new water-sharing agreements but are unable to do so because of insufficient local capacity and resources, including critically needed legal, scientific (hydrological), and social (facilitation/mediation) support. In the resilience assessment phase of the state's 50-year water plan, water-sharing agreements were frequently mentioned by members of the water community as a pragmatic tool for adapting to an increasingly warm and arid climate.

The OSE/ISC has played a role with compiling and interpreting data and with developing recommendations for water sharing rotations and water management during times of shortage. However, local communities may need more capacity building and resources. For example, the Rio Chama Acequia Association in recent years has also needed support from attorneys and

hydrologists to make informed decisions. Altogether, this has resulted in a water sharing agreement on the Rio Chama that could be a model of acequia-agency collaboration. There are also several other communities that are developing water sharing agreements without any involvement of the OSE/ISC, which may also be a valuable experience and model to document and develop as it also retains a sense of local autonomy.

The lessons learned from the existing sharing agreements can help inform how to develop agreements in other places. This documentation will also provide water user groups (irrigation associations, ditch companies, acequias, conservancy districts, and other agricultural groups) with readily accessible documentation of why, where, and how New Mexico communities have developed effective water-sharing agreements, as a basis for learning, capacity-building, and implementation of local, regional, and statewide water plans, including the new 50-year water plan. The specific components of a water sharing agreement include deciding at what change or changes in water scarcity distribution of water will be changed, when and by whom. Methods to address sharing might include a reduction of the days any specific acequia or entity can make a diversion, the amount they can divert, or the time of year that they can divert. Agreements often delineate the times at which the elected leaders of acequias will meet to adjust or implement the sharing agreement. The outputs of this process include:

- Materials: sample agreements, templates, and technical guidance.
- Community Needs Assessments to evaluate where sharing agreements are most urgently needed.
- Hands-on assistance: A dedicated support team that would be deployed to communities that seek to develop water sharing agreements. A core team would include a project manager working for NMAA, an acequia attorney with NMAA, one or more local leaders, and a water sharing liaison (planning staff) from the ISC.
- A technical team would be available as needed to address specific aspects of a water sharing data gathering, analysis, and/or mediation process. The team may include a hydrologist, policy expert, acequia expert, meeting organizer/facilitator, and mediator.

# 5.2 Evaluation Criterion B — Drought Planning and Preparedness (20 points)

In 2018, New Mexico's Office of the State Engineer (OSE) and NM WRRI updated the NM State Drought Plan, which can be found on the OSE's website:

https://www.ose.state.nm.us/Drought/droughtplan.php. A large portion of the plan is relevant to this effort, with particular relevance *Table 5. The Mitigation Action Summary Table* (beginning on p. 22 as numbered at bottom of the pages) and *Appendix C* (beginning on p. C-1), which includes *Table C-1, Drought Task Force (DTF), DTF work groups, and state agency impact, response, and mitigation actions* (beginning on p. C-3), where the plan detailed drought impacts and vulnerabilities throughout the State (the assessment explained in Section VI, p. 14), and plans for drought mitigation (the planning approach explained in section VIII, p. 20) and drought responses (the planning approach explained in section VIII, p. 20) and drought responses (the planning approach explained in section VIII, p. 16). The plan coalesced all the state agencies' drought processes, objectives, and goals, each having its own stakeholder processes. While the plan included consideration of climate change impacts, this project would add considerable analysis to quantify the impacts and potential mitigation actions to minimize needs for responses. Section X (pp. 30-31), future work specifically (highlights added in the attachment to call out these points) calls for the development of drought planning stakeholder processes; assessments of the vulnerabilities, impacts, and mechanisms for addressing challenges and implementation of mitigation actions (by basin, water user type, etc.); the evaluation of the usefulness of water resource models, including NM WRRI's DSWB; and enhanced coordination and communication with Tribes and Pueblos.

### 5.3 Evaluation Criterion C — Sustainability and Supplemental Benefits (15 points)

#### 5.3.1 Other Benefits: Acequia Water and Community Resilience Initiative

NMAA and NM WRRI are collaborating on a larger initiative to build water and community resilience for acequia communities, of which this project is a significant component. Acequia communities are committed to ensuring a future where acequia and agricultural traditions are maintained for all the benefits discussed, food security, ecological benefits, viability of private and community wells. Intensifying drought conditions cause uncertainty and conflict over water, but the implementation of water sharing agreements counters these issues with a process for creating agreements, greater certainty, reducing conflict and ultimately more effective and fair distribution of water, based in values that can be unique for each agreement. The initiative is committed to supporting acequias to continue flowing and have a productive number of irrigation opportunities in a growing season. Additional collected visions for the future include acequias bringing people together in this area, creating prospects for a better, more resilient region and a vision for the future with green agricultural land that maintains the tradition of water sharing, community involvement, and deep connection between history and future generations. People in this region believe that improving watershed health can be accomplished by restoring the region's forests and providing training to new communities on how to work with the acequia system. By assuring food security in the community through youth engagement and cooperative extension projects, this region can become more resilient. Stakeholders expressed that this region needs a comprehensive plan to address drought and build a resilient community by implementing sustainable agricultural and water management methods.

New Mexican farmers and other stakeholders hold many clues to pathways to resilience from a rich and long farming tradition. Close to 700 acequias, a system of mutually managed irrigation channels, developed agricultural infrastructure in New Mexico over 400 years ago, and continue today to protect traditional farming techniques (Arellano, 2014; NMAA, 2019). Acequia governance is structured based on water sharing, as opposed to the "first in time, first in right" prior appropriation structure common in the Southwest, which was established by the mining claim system (The Utton Transboundary Resources Center, 2015). The twenty-three Native Americans Tribes and Pueblos that are currently in New Mexico have ancestors that introduced agriculture an estimated 3,000 years ago (Wills, 1989). These fundamentally different approaches to water governance and the rich and long history provides a depth of traditional practices and knowledge that can inform modern approaches that result in resilient systems.

#### 5.3.2 Climate Change

The proposed project intends to assess what strategies can results in all of the stakeholderidentified resilience benefits, which in addition to drought also include wildfires, upland soil moisture supporting watershed health, and floods. As detailed in section 5.1, the strategies proposed to be assessed would increase the environmental and agricultural buffering capacity, promoting healthy lands and soils, and serve to protect water supplies.

#### 5.3.3 Disadvantaged or Underserved Communities

The proposed project intends to focus on benefitting acequia communities as detailed in section 5.1 and those that share the same water supplies, which covers much of the state of New Mexico. "More than 1 in 5 adults in New Mexico live in communities or neighborhoods that can be considered "economically distressed" (Terrell, 2015).

# 5.3.4 Benefits to Tribes and Pueblos

Tribes and Pueblos are communities that significantly share the same water supplies, as well as value traditional community and agricultural practices. Tribes and Pueblos from mostly the northern parts of the State have identified visions for the future including protecting the health of water resources for communities, cultural traditions, and wildlife; stewardship of resources for future generations; and wet water and infrastructure to provide water for families and restore lush, irrigated fields (Maxwell et al., 2022). Additionally, some of the main strategies they are interested in pursuing include: choosing drought tolerant crops, dryland farming, rainwater catchment, and lessons from elders; integrated regional planning within each watershed that incorporates community collaboration and open conversations; and include Tribes and Pueblos in developing and communicating risk assessments.

#### 5.3.5 Environmental Benefits

The environmental benefits are detailed in section 5.1.3 and 5.3.2

5.4 Evaluation Criterion D – Severity of Actual or Potential Drought Impacts to be addressed by the Project (15 points)

# 5.4.1 The ongoing or potential drought impacts to specific sectors in the project area if no action is taken, and the quantified severity of those impacts

Agricultural and economic impacts. Less winter precipitation and higher temperatures have diminished snowpacks, resulting in the major surface water trends of quantity declines and timing changes, with flows coming earlier in the season (Figure 7). According to the DSWB model described in section 3.1.1.4, in one of the WPRs in the NRG Basin, the Jemez Y Sangre WPR, average temperatures have increased by slightly over 2° F since 1975. The future projected (2019-2099) monthly average surface water into the region show earlier and shorter peaks and 55% of the surface water volume of the average historic period (1975-2018). Current trends indicate that average annual flow has decreased by 467,000 AF over the 44 years of data, which would reflect a flow at 61% the level at 1975 (a point along the trendline), and projected in 2097 (also a point along the trendline) to be 21% of the level at 1975. The SJ Basin has similar dynamics. In many parts of New Mexico, reduced surface water supplies have increased reliance on and diminished groundwater stocks, which also further reduces water quality. For New Mexico in general, the reduction of surface water supplies has resulted in 26% less land being irrigated in 2017 than in 1997 (USDA NASS, 2019). These dynamics contribute to the State's farmers facing significant socio-economic challenges, including widespread declining rural populations with economies lagging behind urban areas (Patrick & Blayney, 2022), an aging farmer population with over 40% over the age of 65, and 78% of farms close to or not breaking even, generating less than \$10,000 of revenue annually (USDA NASS, 2019). Acequias in the State are concerned about the viability of the agricultural communities and are calling for innovative policies that support resilience.

Stakeholders have confirmed that they are experiencing these trends (Maxwell et al., 2022). Water managers in the NRG Region have observed the reduction in river volume, the decrease in surface water from 2002 to 2018 when compared to 1979-2002, as well as the drying of springs. The watershed's health has worsened due to erosion and exotic trees, as well as unanticipated floods and droughts. Growth in water consumption has also occurred as a result of the addition of new towns to the region, posing a new difficulty. People in this region are tied to the soil and rely on springs for irrigation, but drought and climate change have resulted in a lack of green and productive agricultural land. Water managers in the San Juan Basin region cite the

overall dynamic of declining snowmelt runoff, and erosion of bare soil negatively impacts soil health and surface water quality. Tribes and Pueblos from mostly the northern parts of the State have cited issues of water quality compromised by wildfires, sediment, and mining; extreme water shortages, increasing temperature; water rights adjudications being time consuming; a lack of funding to address aging infrastructure, lack of certainty of infrastrucuture modernization choices.

**Public health concerns or social concerns.** "Fueled by abnormally dry, warm conditions and spread by strong winds, wildfires have burned more than 600,000 acres across New Mexico this spring — making it one of the worst fire years in the state's recorded history" (Wallace & Popovich, 2022). This year's fires are likely to be devastating for many communities, particularly after the monsoonal rains come in the late summer and the runoff increases energy on the bare ground of the areas affected, scouring and washing soils and debris downstream into agricultural fields and communities. A report from 2016 shows an analysis that the number of fires in the West is increasing dramatically, and quantified that "more than 1.4 million people in New Mexico, or 70 percent of the state's population, are living in areas at elevated risk of wildfire" (Kenward, Sanford, & Bronzan, 2016).

Roughly half of the public water systems in the project area rely on a single source for their drinking water, with approximately 30% getting their water from surface water or springs. All of these systems face potential water quantity issues as drought, changing precipitation regimes, and higher temperatures influence water availability and recharge. These effects potentially result in the drying of wells and springs. One of the primary resources for a water system in emergency situations is the NM WARN (New Mexico Water / Wastewater Agency Response Network), which is a private, voluntary agreement between systems to help each other in these situations. Violations to drinking water standards occur as a consequence of secondary impacts from drought such as wildfire (turbidity, increased nutrients, *E. coli*).



Figure 7. a) Dominant regional water dynamics are shown in b) for a Water Planning Region in the Northern New Mexico Rio Grande Basin (the Jemez y Sangre WPR) and c) the San Juan Basin WPR. b) A major surface water dynamic for the WPR in the northern New Mexican Rio Grande basin as depicted by historic (1975-2018) vs. projected (2019-2099) average quantities of surface water into the region over a year show earlier and shorter peaks and significantly overall less surface water quantity on average and significant quantity declines. c) Projected surface water into the San Juan WPR indicate similar dynamics, significantly overall less surface water quantity on average and significant quantity on average and significant quantity declines.

Regions of New Mexico with Acequia Water Distribution Systems: Tools to Adapt to Water Scarcity and Guide Implementation of Strategies to Increase Acequia Community and Water Resilience

*Environmental impacts.* Less precipitation coupled with higher temperatures has reduced soil moisture, reducing vegetation cover across New Mexico. With increasing intensity storm events, drought is leading to increased catastrophic flooding, which is a particularly large risk in areas affected by wildfires. This flooding in turn scours vegetation, further reducing infiltration. Analysis of historical measures of these effects and estimates of projected conditions will be conducted by this project. Reductions in irrigation are decreasing recharge to groundwater just when reliance on groundwater is increasing. Fallowed land has also resulted in soil degradation, increased noxious weeds, and reduced farmer livelihoods (Summitt, 2011). Declining groundwater levels also affect riparian areas. The lower the water, the further declines in water quality for salinity and the less support the groundwater provides for the riparian corridor.

#### 5.4.2 Recent, existing, and potential drought conditions in the project area

The Southwest region has been experiencing mega-drought in the last two decades (Williams, Cook, & Smerdon, 2022). Water stress in the region is projected to increase substantially over the next decades and in the latter half of the 21st century (Dettinger, Udall, & Georgakakos, 2015), with more severe droughts (Cook, Ault, & Smerdon, 2015), less snowpack and spring runoff (Fyfe et al., 2017), and increased flooding from higher intensity storm events (Loisel, MacDonald, & Thomson, 2017).

Per the U.S. Drought Monitor (USDM), over 100% of New Mexico is currently in

drought (Figure 8), with over 90% in extreme drought and 47% in exceptional drought. NM has experienced several severe drought periods in this century, particularly 2002-2004, 2011-2014, 2018, 2021, and currently 2022 (Figure 9). Table 2 presents the average USDM values of the NRG Basin and SJ Basin Regions for the available USDM and DSWB period of record (2002 to 2018). USDM values of 0, 1, 2, 3, and 4, represent abnormally dry conditions, moderately dry, severe drought, extreme drought, and exceptional drought, respectively. The USDM values for the two basin regions drought periods of 2002-2004 and 2011-2014 represented mostly extreme drought.



Figure 8. Current U.S. Drought Monitor map for New Mexico. 100% of New Mexico is currently in drought, with over 90% in extreme drought and 47% in exceptional drought.



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For the NRG and SJ Basin Regions, **Table** 3 summarizes the water budget components from the DSWB comparing two recent drought periods, 2002-2004 and 2011-2014, to the full DSWB historical period of 1975-2018. During these two drought periods in the NRG and SJ Basin Regions, precipitation ranged from 80-86% of the 44-year average. Less precipitation during these drought periods reduced water availability for

Table 2. The average USDM Values for different drought periods in the Northern NM Rio Grande Basin and San Juan Basin Regions.

	Average USDM Value							
Basin Region	2002- 2018	2002- 2004	2011- 2014					
Northern NM Rio Grande	1.8	3.4	2.5					
San Juan	1.9	3.3	2.5					

evapotranspiration on the land surface to 84-90% of average, and dramatically reduced runoff to 33-48% of average. Surface Water (SW) Supplies into the regions were dramatically lower during the two drought periods, with SW In flows ranging from 53-65% of the 44-year average. Modeled SW diversions for all nine OSE water use categories averaged over the 44-year historical period were 387,000AF/yr for NRG and 464,000 AF/yr for SJ. T hese values are significantly greater than the modeled groundwater (GW) diversions for all nine OSE water use categories, which on average were 36,000 AF/yr for NRG and 10,000 AF/yr for SJ. These data indicate that these two basin regions are more reliant on SW than on GW. Surface Water Diverted Water for Agriculture (Ag) had considerable variability with most of the drought values being 134-152% of the 44-year average; however, the 2011-2014 average in the SJ basin was considerably lower, at 31% of the 44-year average. These data likely indicate the additional demand for SW, which in some areas can be supplied by reservoirs pending available storage.

# 5.5 Evaluation Criterion E — Project Implementation (10 points)

The implementation plan with a description of the project leadership	n of the propose Table 3. The avera	d project is detailed in Sectio age values for DSWB components com	n 3, and summarized here paring their full period of available
and the estimated	historical data (bol Basin Region.	ded) to recent drought periods in North	nern NM Rio Grande and San Juan
milestones in <b>Table 4</b> .	All values are	Northern NM Rio Grande (NM NRG) Basin Region	San Juan (SJ) Basin Region
No permits,	AF/vr	<b>1975-</b> 2002- % of 2011- % of	<b>1975-</b> 2002- % of 2011- % of

engineering design, or policies or administrative actions will be required to implement the project.

Project team leadership: New Mexico Acequia Association (NMAA): Paula Garcia, Serafina Lombardi, Enrique Romero, Jaimie Park

• New Mexico Water **Resources Research** Institute (NM WRRI)

All values are	Nor	thern NI	M Rio G	irande	(NM	Sar	gion			
average 1,000 AF/yr	1975- 2018	2002- 2004	% of avg	2011- 2014	% of avg	1975- 2018	2002- 2004	% of avg	2011- 2014	% of avg
Precipitation	7600	6400	84%	6100	80%	5900	5100	86%	4800	81%
Land Surface ET	6560	5900	90%	5500	84%	5625	4900	87%	4700	84%
Runoff	469	158	34%	179	38%	126	61	48%	42	33%
Recharge	571	350	61%	376	66%	138	114	83%	95	69%
SW In	1388	730	53%	864	62%	1556	826	53%	1015	65%
SW ET	103	149	145%	92	89%	94	80	85%	116	123%
SW Diversions	387	310	80%	322	83%	464	438	94%	296	64%
GW Diversions	36	35	97%	49	136%	10	7	70%	7	70%
GW ET	64	66	103%	68	106%	64	67	105%	65	102%
Human Use ET	121	123	102%	139	115%	175	208	119%	116	66%
SW Diverted Water for Ag only	128	172	134%	176	138%	128	195	152%	40	31%
Ag depletions (consumptive use req.'s)	61	68	111%	67	110%	70	110	157%	16	23%

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Sam Fernald, Director, and NM WRRI's Water and Community Collaboration Lab (WCC-Lab) Connie Maxwell, Yining Bai, Kaustuv Neupane. NMWRRI will support NMAA in facilitating the regional working and advisory groups, develop the online decision-support water budget modeling tools including integration of additional data, use the model to estimate the effects of the stakeholder-identified drought mitigation strategies to improve water management, and support the efforts to integrate the strategies into regional planning frameworks. Note that NM WRRI produced the New Mexico Drought Plan with the OSE.

• New Mexico Interstate Stream Commission (ISC): Andrew Erdmann, and Basin Managers from all 5 major river basins of New Mexico. The ISC will support Objective 3, Integrate drought mitigation and response actions into regional water management and the regional planning frameworks.

#### 5.6 Evaluation Criterion F —

# Nexus to Reclamation 5.6.1 Nexus to Reclamation projects and activities

There is a strong nexus between the need for this project and several Reclamation projects, where the analysis will provide information to water users to optimize the surface water supplies that Reclamation

#### Table 4. Project Schedule and Milestones

	2023		2024				2025					
Task	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
Project Administration												
Execute agreement with Reclamation												
Grant reporting												
Project Milestones												
Regular meetings												
Advisory board meetings												
NNMRG & SJ regional working group meetings												
Other NM regional working group meetings												
NMAA & NMWRRI publicize updates on progress												
Collaborative decision-support tool development												
Assess water sharing practices and agreements												
Collect stakeholder water management strategies												
Collect additional data needed for management assessments												
Model structure initially adapted and on-line						0000046000						000000000
Test and validate the model and scenarios												
Management strategies and modeled results effects compiled												
into draft handbook (online and brochure)												
Model revised with feedback and additional data												
Model final recalibration and revalidation												
Model and management effects' handbook finalized												

manages. These decision-support tools will help improve water management, more equitably share scarce water supplies, and mitigate conflicts among water users in the basin, which Reclamation is often called upon to mediate. The project area for the decision-support tool development for the Northern NM Rio Grande Basin includes the Reclamation reservoirs of Heron, El Vado, and Nambe Falls. This basin is the upstream source of waters in Reclamation's Rio Grande Project, which includes water storage in the Elephant Butte and Caballo Reservoirs, and the Mesilla Diversion. The San Juan Basin includes the Reclamation reservoir of Navajo Lake. The other basins of New Mexico that also include Reclamation reservoirs are: Sumner and Fort Sumner Diversion, Brantley, and Avalon in the Pecos River Basin.

# Project Budget

# 1 Funding Plan and Letters of Commitment

See attached letters in the Letters of Support section. The non-Federal share of project costs will be obtained as follows (see Table 2):

- Recipient (NMAA): will contribute an in-kind match of \$226,136 and will utilize \$75,000 match from other entities (from NM ISC)
- New Mexico Water Resources Research Institute (NMWRRI): will contribute an in-kind match of \$972,659.63 and utilize match from other entities \$190,890.00 (NMDA, NMBGMR and \$150,000 of NMISC)
- New Mexico Interstate Stream Commission (NM ISC): will contribute an in-kind match of \$225,000
- New Mexico Department of Agriculture (NMDA): will contribute an in-kind match of \$30,000
- New Mexico Bureau of Geology & Mineral Resources (NMBGMR): will contribute an in-kind match of \$10,890

# 2 Budget Proposal

# Table 1. Total Project Cost Summary

SOURCE	AMOUNT	
Costs to be reimbursed with the requested Federal funding	\$	1,464,685.15
Costs to be paid by the applicant	\$	226,135.52
Value of third-party contributions	\$	1,238,549.63
Total Project Cost	\$	2,929,370.30

# Table 2. Non-Federal and Federal Funding Sources Summary

FUNDING SOURCES	AMOUNT	
Non-Federal Entities		
NMAA match	\$ 22	6,135.52
NM ISC match	\$ 22	5,000.00
NMDAmatch	\$ 3	0,000.00
NM WRRI match	\$ 972	2,659.63
NMBGMR	\$ 1	0,890.00
Non-Federal Subtotal	\$ 1,46	4,685.15
Requested Reclamation Funding	\$ 1,46	4,685.15

 Table 3. Budget Proposal – see next page

# Regions of New Mexico with Acequia Water Distribution Systems: Tools to Adapt to Water Scarcity and Guide Implementation of Strategies to Increase Acequia Community and Water Resilience

RESILIENCY TOTAL GRANT					Fed/Non-Fed Match worksheet							
BUDGET ITEM DESCRIPTION		COMPUTAT	ION	Quantity	TC	TAL COST	REC	CIPIENT		MATCH	REC	LAMATION
	\$/U	nit and Unit	Qnty	Туре			FU	NDING	FR	OM OTHER	I	UNDING
	2						M	ATCH	P	ARTNERS		
SALARIES AND WAGES			su	btotal->	\$	91,664	\$	-	\$	75,000 3	\$	16,664
Paula Garcia, Executive Director	\$	39.01	312	hours	\$	12,171	-		\$	12,171	\$	-
Serafina Lombardi, Program Director	\$	29.83	468	hours	\$	13,960			\$	13,960	\$	
Enrique Romero, Director of Legal Services	\$	48.48	780	hours	\$	37,814			\$	37,814		
Staff Attorney	\$	39.34	468	hours	\$	18,411			\$	11,054	\$	7,357
Juliet Garcia Gonzalez, Operations Manager	\$	29.83	312	hours	\$	9,307					\$	9,307
FRINGE BENEFITS			su	btotal->	\$	36,666	\$	-	\$	-	\$	36,666
Paula Garcia, Executive Director	1.00		40%	Los serveras	\$	4,868	1778-5		1		\$	4,868
Serafina Lombardi, Program Director			40%		\$	5,584					\$	5,584
Enrique Romero, Director of Legal Services			40%		\$	15,126					\$	15,126
Staff Attorney			40%		\$	7,364					\$	7,364
Juliet Garcia Gonzalez, Operations Manager	5		40%		\$	3,723		201010210			\$	3,723
TRAVEL			su	btotal->	\$	5,625	\$	-	\$	-	\$	5,625
Advisory, working group, and additional	\$	125.00	45	trips	\$	5,625					\$	5,625
meetings	-			ubtotal s	_				_		_	
			Su	blolal->	•	450	¢		¢		¢	450
Drints to support montings	¢	0.75	600	mootings	ф (	450	Ŷ	-	.р		ф 2	450
	φ	0.75	000	htotal->	\$	2 523 659	\$	90 482	\$	1 163 550	ې ۲	1 269 627
Consultant/Contr - 1 Additional NMAA con	: sult:	ants	Su	intotal->	\$	196 560	\$	90,402	\$	1,103,330	\$ \$	1,207,027
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Dr. Connie Maxwell, Project Leader	\$	30.000	3	1040 hrs	\$	90.000			\$	45.000	\$	45.000
Two Research Scientists	\$	113 884	3	2080 ea	\$	341 652			\$	170 826	\$	170 826
Two Postdoctoral Researchers	\$	120,000	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	2080 ea	s.	360,000			\$	180,000	\$	180,000
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Two Graduate Students	\$	49,160	3	1040 ea.	\$	147,480			\$	73,740	\$	73,740
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Fringe			SL	ubtotal->	\$	310,546	×		\$	155,273	\$	155,273
Regular employee 37.5%	\$	825,762	37.5%		\$	309,661			\$	154,830	\$	154,830
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Equipment - none included			SL	ubtotal->	\$	-			\$		\$	· .
Supplies/Materials			SL	ubtotal->	\$	600	d.		\$	300	\$	300
printing for handouts	\$	0.75	800	per page	\$	600			\$	300	\$	300
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OTHER COSTS			su	btotal->	\$	5,000	\$	2,500	\$		\$	2,500
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IOTAL DIRECT COSTS					\$	2,663,064	\$	92,982	\$	1,238,550	\$1	1,331,532
Indirect costs - 10%	8		10%	5	\$	266,306	\$	133,153			\$	133,153
TOTAL PROJECT COSTS				1. S	\$	2,929,370	\$	226,136	\$	1,238,550	\$	1,464,685

# 3 Budget Narrative

### 3.1 Salaries and Wages - \$91,664

- Paula Garcia, Executive Director, @ approx. 2 hours a week for the 3 years for a total of 312 hours, will oversee all aspects of the NM WRRI's scope and services, with a particular focus on model development and analysis of results.
- Serafina Lombardi, Program Director, @ approx. 3 hours a week for the 3 years for a total of 468 hours, will, with the support of NM WRRI, lead the project administration, general coordination of entities, facilitate advisory group and regional working group meetings, and conduct outreach for stakeholder diversity
- Enrique Romero, Director of Legal Services, @ approx. 4.65 hours a week for the 3 years for a total of 725 hours, will, with the support of the staff attorney and a consultant mediator, lead the water sharing agreement legal analysis and strategy for the activities
- Staff Attorney, @ approx. 3 hours a week for the 3 years for a total of 468 hours, will support Mr. Romero
- Juliet Garcia Gonzalez, Operations Manager, @ approx. 2 hours a week for the 3 years for a total of 312 hours, will lead the logistical and business needs of the project

The labor required for the Salaries and Wages execution of this project will be carried out by NMAA staff and employees (for consultant labor see section 3.5). The cost of labor is derived from the current pay rates of NMAA employees. The Davis-Bacon Wage determinations do not apply to this grant.

### 3.2 Fringe Benefits - \$36,666

Fringe benefits for the employees assigned to this project are 40% of wages. This fringe is derived from the actual costs for personnel at NMAA. The fringe benefit package includes FICA, medical, dental, vision, short and long term disability, life insurance, retirement benefits, annual leave, sick leave and holiday leave, W/C and unemployment insurance.

#### 3.3 Travel - \$5,625

• Biannual working group meetings, annual advisory group meetings, and intermediate sub-working group meeting are estimated at 45 trips total at 200 miles @0.625 a mile.

# 3.3 Equipment - \$0.00

# 3.4 Materials and Supplies - \$450.00

• NMAA will produce supplemental materials for 4 annual intermediate sub-working meetings of approx. 5pp, for approx. 10 participants @ \$0.75 per print. Total supplies budget totals \$450.

#### 3.5 Contractual - \$2,523,659.25

# 3.5.1 Consultant/Contr - 1. Additional NMAA consultants - \$196,560.00

This item represents two additional individual consultants as described below:

- a mediator to assist in negotiating water sharing agreements and establishing future use and flexibility needs at \$200/hr. at an average of 4 hrs. a week for the 3 years
- a hydrologist and/or water resource specialist to conduct modeling or site investigations for specific needs at \$200/hr. at an average of 4 hrs. a week for the 3 years
- Indirect Costs: NMSU's F&A indirect rate is calculated at 48% of modified direct costs

Total project Total: \$196,560.00

Total funding requested: \$98,280.00 Total NMAA match: \$98,280.00

### 3.5.2 Consultant/Contr - 2. NM WRRI - \$45,739.96

New Mexico Water Resources Research Institute (NMWRRI) will support NMAA in facilitating the regional working and advisory groups, develop the online decision-support water budget modeling tools including integration of additional data, use the model to estimate the effects of the stakeholder-identified drought mitigation strategies to improve water management, and support the efforts to integrate the strategies into regional planning frameworks. Salaries and Wages:

- Dr. Alexander (Sam) Fernald, Project Director. Dr. Fernald will oversee all aspects of the NM WRRI's scope and services, with a particular focus on model development and analysis of results.
- Connie Maxwell, Project Lead @ 1040 hours annually (0.50 FTE), roles include support to NMAA for general coordination of entities, facilitator for advisory group and regional working group meetings, outreach for stakeholder diversity, and oversight and supervision of team for development of alternative management practices and scenarios, including required spatial analysis, model development, and on-line visualization of model, model results, and management scenario handbook.
- Two Research Scientists @ 2080 hours each annually (1.0 FTE), roles include interim coordination with stakeholders, collaboration and development of model, including search for existing data to support estimating effects of scenarios.
- Two Postdoctoral Researchers @ 2080 hours each annually (1.0 FTE) roles include collaboration and development of model, including search for existing data to support estimating effects of scenarios.
- Two Graduate Researchers @ 1040 hours each annually (0.50 FTE), spatial analysis of alternative management practice.

#### Fringe

Calculated at 37.5% for regular employees and 0.6% for graduate students

Travel

• Biannual working group meetings, annual advisory group meetings, and intermediate sub-working group meeting are estimated at six trips annually. The project lead is Maxwell anticipated to attend all at 827 miles @0.625 a mile. The project director, research scientist, postdoctoral researcher, and graduate student are expected combined to make 9 trips at 968 miles @0.625 a mile. Total travel budget totals \$8,546.

Supplies

• NMWRRI will produce twice a year short leave-behind brochures / summaries, including online-instructions, modeling scenarios, and results of approx. 10pp, for approx. 40 participants @ \$0.75 per print. Total annual supplies budget totals \$600.

Consultant

Intera

• \$80,000 annually. Austin Hanson and additional staff as needed will consult to support NM WRRI in the development and implementation of the decision-support model and its on-line application.

Other Direct Costs

- Tuition for 2 graduate students. 18 credit hours per year at \$343 per credit hour
- Health insurance for two graduate research assistants at \$200 per month for three years each.

Indirect Costs: NMSU's F&A indirect rate is calculated at 48% of modified direct costs

NMWRRI Project Total: \$2,327,099.25

Total funding requested: \$1,163,549.63

Total match: \$1,163,549.63 = NM WRRI in-kind: \$972,659.63 + from other entities: \$190,890.00

# **Required Permits or Approvals**

None required

# **Official Resolution**

The New Mexico Acequia Association has had to put off its board meetings due to personal effects from fire in New Mexico and will submit the official resolution within 30 days as specified in the NOFO.

Associacion de Acequia Nortenas de Rio Arriba P.O. Box 96 Los Ojos NM 87551

Bureau of Reclamation Ms. Sheri Looper Mail Code: MP-400 2800 Cottage Way Sacramento, California 95825

RE: WaterSMART Drought Response Program: Drought Resiliency Projects for Fiscal Year 2023 (DRP)

June 8, 2022

Dear Ms. Looper,

On behalf of Associacion de Acequia Nortenas de Rio Arriba, we are writing to state our strong support for the proposed project entitled "*Regions with Acequias in the Northern Rio Grande and San Juan Basins of New Mexico: Tools for Planning and Adapting Water Sharing Agreements and Implementing Strategies that Increase Water and Community Resilience,*" submitted by the New Mexico Acequia Association. We are also stating our commitment of collaboration to play a leadership role in the project, participate as members of the regional working groups, and facilitate integrating drought mitigation strategies and response actions into regional planning frameworks.

The purposes for which this Corporation is formed are exclusively charitable, educational and scientific and consist of the following: The specific and primary purposes are:

(1) To educate, inform, advise and assist acéquias and their members about their water rights, the laws and regulations pertaining to their water rights, and historical uses, agreements, and customs relating to water uses.

(2) To educate, inform, advise and assist acéquias and their members about water rights adjudication suits and other court and administrative proceedings which affect acéquias and their members' water rights.

(3) To educate, advise and assist acéquias and their members and the public on water conservation practices that will protect, preserve, and enhance this natural resource.

(4) To protect and defend the water rights of acéquias and their individual members in water rights adjudication suits.

(5) To seek to have enforced all historical uses, agreements, and customs; to establish accurate and fair priority dates; and to protect all rights of irrigation of acéquias and their individual members in adjudication suits and all other court and administrative proceedings.

(6) To assist acéquias and their members in acquiring and holding in trust water rights in order to protect, preserve, and enhance this natural resource.

(7) To develop and implement community economic development efforts for low-income or rural communities focused on fostering sound management practices of agricultural land and water.

(8) To employ researchers, attorneys, historians, anthropologists, archaeologists, economists, surveyors, abstractors, translators, and other expert witnesses and to purchase supplies, maps, reports, studies, photographs, documents, and other materials and supplies as necessary and appropriate to inform, educate, promote, protect, and defend the water rights of acéquias and their members and all historic uses, agreements, and customs relating to and affecting the water rights of acéquias and their members.

(9) To do any and all lawful activities which may be necessary, useful or desirable for the furtherance, accomplishment, fostering, or attaining of the foregoing purposes, in conjunction or cooperation with others, whether such others be persons or organizations of any kind or nature.

The ongoing drought is challenging acequias to provide adequate water for agricultural uses while sharing water within the communities and downstream user. Agreements between senior water rights and junior water rights are on-going to minimize the negative impacts but the continuance of the drought is complicating even what we consider senior water rights within communities and downstream users.

Water rights administered within the State of New Mexico are not likely to change given the complexity but the need for collaboration, cooperation, coordination, and communication amongst all water users must be of the utmost importance as we move forward given the drought pattern and perhaps changing climatical conditions.

Research and education are paramount to meet the challenge of drought, changing climate patterns, increasing demand not only within the state but adjoining states and nations.

Respectfully submitted,

Medardo Sanchez

Medardo Sanchez, Associacion de Acequia Nortenas de Rio Arriba 575-588-7858 P.O. Box 96 Los Ojos NM 87551

Bureau of Reclamation Ms. Sheri Looper Mail Code: MP-400 2800 Cottage Way Sacramento, California 95825

RE: WaterSMART Drought Response Program: Drought Resiliency Projects for Fiscal Year 2023 (DRP)

June 7, 2022

Dear Ms. Looper,

On behalf of Rio de Chama Acequia Association (RCAA) we are writing to state our strong support for the proposed project entitled "Regions with Acequias in the Northern Rio Grande and San Juan Basins of New Mexico: Tools for Planning and Adapting Water Sharing Agreements and Implementing Strategies that Increase Water and Community Resilience," submitted by the New Mexico Acequia Association. We are also stating our commitment of collaboration to play a leadership role in the project, participate as members of the regional working groups, and facilitate integrating drought mitigation strategies and response actions into regional planning frameworks.

- RCAA is a non-profit regional acequia association incorporated in 1996 in response to State of New Mexico vs. Aragon adjudication lawsuit of surface water rights in the Rio de Chama basin. RCAA represents 18 acequias below Abiquiu reservoir to the community of El Guache. Those acequias represent 500+ parciantes. RCAA currently maintains water sharing agreements with the following entities, Acequias Norteñas and Ohkay Owingeh Pueblo. RCAA also participates in water sharing and alternative management efforts with the Middle Rio Grande Conservancy District (MRGCD) and the New Mexico Interstate Stream Commission Active Water Management program.
- During this mega-drought, RCAA needs much needed infrastructure improvements to
  utilize dwindling water supplies in an efficient and productive manner while maintaining
  our fragile ecosystem. Due to the damages created by the Cerro Grande and Las
  Conchas fires in the Jemez mountains, it created a dire need to manage our watershed
  in order to convert occasional flood waters which cause much damage to our
  infrastructure into a system that allows those waters to recharge the aquifer and
  beneficial use for our farmers and ranchers.
- An important strategy is for RCAA to benefit from flood flows that would normally be unusable and/or cause damages to our infrastructure. This will achieve two priorities. 1.
   Allow us to harness that water to recharge our aquifer and 2. allow our parciantes an additional source of water to alleviate our dwindling surface water supplies.

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President, Rio de Chama Acequia Association, Inc. Concilio member, New Mexico Acequia Association Advisory committee, New Mexico Water Resources Research Institute. Farmers Mutual Community Ditcha 51 road 6893a Waterflow, New Mexico 87421a

Bureau of Reclamationa Ms. Sheri Loopera Mail Code: MP-400a 2800 Cottage Waya Sacramento, California 95825a

RE: Water SMART Drought Response Program: Drought Resiliency Projects for Fiscal year 2023

# 6/13/22

# Ms. Looper;

On behalf of Farmers Mutual Community Ditch, we are writing to state our strong support fora the proposed project entitled "Regions with Acequias in the Northern Rio Grande and San Juana Basins of New Mexico: Tools for Planning and Adapting Water Sharing Agreements and Implementing Strategies that Increase Water and Community Resilience" submitted by New Mexico Acequia Association. Farmers Mutual Community Ditch, with water delivery authority ina our basin affirms its partnership with the New Mexico Acequia Association. We are also statinga our commitment of collaboration to play a leadership role in the project, participate asa members of the regional working groups, and facilitate integrating drought mitigationa strategies and response actions into regional planning frameworks.a

Farmers Mutual Community Ditch was chartered in the 1880's serves 690 shareholders anda 4182.51 irrigated acres at an allotted rate of 3.1 acre-feet per acre annually, from 22 miles of acequia. This acequia also serves as a main supplier of domestic water for Lower Valley Watera Users Association and Upper LaPlata Water Users. These two associations serve approximately 3500 residences. For the last 5 years we have been working with the Army Corp to pipe about 1a 1/2 miles of the acequia under a bluff that keeps having rock slides damaging the acequia anda costing extensive repairs. With any luck we will pipe approximately 4,480 feet this winter,a depending how far our funding will go. We have several areas that were concreted years agoa and the concrete is all broken and water is leaking out the bottom of the ditch. We are currently working with the (ASCS) Agriculture Soil and Conservation Service and NRCS to pipe a

small portion of the worst area. This year we have a group that are farming several acres of land that was fallow and hardly farmed, by installing center pivots and ponds lined with bentonite. Our bylaws have a priority use of water in case of a drought and water shortages.

- 1. Agriculture and food crops, including gardens and orchards, and de minimums livestock use
- 2. Domestic use and municipal use
- 3. Non-Agriculture irrigation use, such as irrigation of lawns
- 4. Recreation use

We also have set up a rotation system where all the headgates are numbered and painted, when the water is low one third of the headgates are shut off for one week and then can irrigate the next two weeks while another third are shut off each week. This insures water to the end of the acequia for everyone.

Agriculture land is slowly disappearing along with the water it takes to make that land productive; we have to be better stewards of both to supply the needs of our community and country. This project can help make that happen.

THANK YOU;

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Alan C. Walraven Chairman of Farmers Mutual Community Ditch

Bureau of Reclamation Ms. Sheri Looper Mail Code: MP-400 2800 Cottage Way Sacramento, California 95825

RE: WaterSMART Drought Response Program: Drought Resiliency Projects for Fiscal Year 2023 (DRP)

June 10, 2022

Dear Ms. Looper,

On behalf of the Regional Association of Las Nueve Acequias, we are writing to state our strong support for the proposal project entitled "Regions with Acequias in the Northern Rio Grande and San Juan Basins of New Mexico: Tools for Planning and Adapting Water Sharing Agreements and Implementing Strategies that Increase Water and Community Resilience," submitted by the New Mexico Acequia Association. We are also stating our commitment of collaboration to play a leadership role in the project, participate as members of the regional working groups, and facilitate integrating drought mitigation strategies and response actions into regional planning frameworks.

Las Nueve Acequias Regional Association has been in existence for over three hundred years with each of the nine acequias assisting each other in times of need. Our Association has been known by different names over the centuries and have united when our water rights and way of life have been threatened or when there are opportunities for improving our infrastructure, farm management methods or governance capabilities. Although each of the nine acequias is a separate political subdivision of the state of New Mexico the association of the nine acequias unites us to support each other and the region.

Our region has faced many periods of drought over the last four hundred years but according to many of our elders, tradition reveals that our current drought caused by the effects of climate change has been the most prolonged and severe. Our acequias and the many landowners that depend on the flow of the Rio Grande River have persevered and have been able to survive by utilizing ancient customs that prioritize the idea of sharing in times of plenty and also in times of scarcity of water. The last decade has been exceptionally stressful on our landscape with many of our native species of trees and plants slowly drying up. It has been especially evident in the uplands that make up our watersheds.

Even though our ancient customs have allowed us to continue to survive we are now experiencing a period of drought that is unprecedented. Therefore, the prospect of developing drought mitigation strategies and responses such as forest, range and farmland management based on data sources and drought indicators could be of great benefit during this expected prolonged period of drought. Many of our parciantes (water right owners) are slow to adapt to changes such as switching from planting and harvesting alfalfa for their animals to more drought resistant types of feed. With trustworthy data and evidence that can come out of this project our landowners will find it easier to adapt to new farming techniques.

Many of the agricultural practices currently utilized within our region have been learned from the many years of passing on knowledge from generation to generation. It is also evident that farming methods practiced today have been borrowed from others including some of our Native American neighbors. What is unique about this proposal is that farming techniques from other regions will be made available to all acequias in the state via online and there is a tremendous opportunity to learn from each other. Individual acequia and regions sometimes tend to work in silos and don't have opportunities to learn from others. This project will publish and disseminate lessons learned and integrate them into regional decision-making models using regional data sources and factors that will indicate protection of water quantity and quality for the environment, agriculture and the eco system within our communities. Acequias and traditional agriculture provide many drought mitigation and ecosystem service benefits for the larger community, from aquifer recharge to habitat for migrating birds, and neither of these benefits nor the strategies to protect these benefits are often well understood. This project promises to reveal these service benefits within our acequias and to the larger community.

The leadership of the Las Nueve Acequias as well as our many parciantes are excited about participating in this proposed Drought Resiliency Project and will be available to play a leadership role and we also stand ready to implement drought mitigation strategies developed to facilitate long-term planning for resilience.

Respectfully,

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Alfredo Montoya, President Las Nueve Acequias Regional Association



# **North Farmington Ditch**



2112 W. Apache Street, Farmington, New Mexico 87401

June 15, 2022

Bureau of Reclamation Ms. Sheri Looper Mail Code: MP-400 2800 Cottage Way Sacramento, California 95825

RE: WaterSMART Drought Response Program: Drought Resiliency Projects for Fiscal Year 2023 (DRP)

Dear Ms. Looper,

On behalf of North Farmington Ditch, we are writing to state our strong support for the proposed project entitled "*Regions with Acequias in the Northern Rio Grande and San Juan Basins of New Mexico: Tools for Planning and Adapting Water Sharing Agreements and Implementing Strategies that Increase Water and Community Resilience*," submitted by the New Mexico Acequia Association. North Farmington Ditch, with water delivery authority in the Animas River basin affirms its partnership with the New Mexico Acequia Association. We are also stating our commitment of collaboration to play a *leadership role in the project, participate as members of the regional working groups, and facilitate integrating drought mitigation strategies and response actions into regional planning frameworks.* 

The North Farmington Ditch traverses approximately 7 miles of alluvial terrace through the City of Farmington. The North Farmington Ditch provides water for agriculture and urban landscapes; it also provides agricultural water for the Wright Leggett Ditch that traverses the floodplain of the Animas River.

The North Farmington Ditch suffers from chronic water shortages because the headgate is the last (lowest) on the Animas River. Water sharing agreements among water users on the Animas are in place but are all too often ignored. We need a better system to manage water in the Animas basin to make water availability more reliable.

The Animas River headwaters are in Colorado and the rivers flow regime has been altered by the Animas-LaPlata Project constructed by BOR. It is our desire to work with BOR to establish a water budget that serves the interests of Colorado and New Mexico users

Sincerely,

Douglas D. Dykeman, President North Farmington Ditch



Pojoaque Valley Irrigation District 9 Cities of Gold Road Santa Fe, New Mexico 87506 (505) 455-2693 Email: pvidistrict1@hotmail.com "Water is Life"



Bureau of Reclamation

Ms. Sheri Looper Mail Code: MP-400 2800 Cottage Way Sacramento, California 95825

RE: WaterSMART Drought Response Program: Drought Resiliency Projects for Fiscal Year 2023 (DRP)

June 14, 2022

Dear Ms. Looper,

The Pojoaque Valley Irrigation District, (PVID) wants to state our strong support for the proposed project entitled "*Regions with Acequias in the Northern Rio Grande and San Juan Basins of New Mexico: Tools for Planning and Adapting Water Sharing Agreements and Implementing Strategies that Increase Water and Community Resilience*," submitted by the New Mexico Acequia Association. We will collaborate and play a leadership role in the project, participate as members of the regional working groups, and facilitate integrating drought mitigation strategies and response actions into regional planning frameworks.

The PVID is the managing contractor with the BOR for the San Juan/Chama Project, Nambé Falls Dam and Reservoir. We provide Irrigation water from the reservoir to the Pueblos of Nambé, Pojoaque and San Ildefonso, as well as several hundred non-Native American water rights owners. The Pueblo water rights have a time-immemorial priority. Many of the non-pueblo acequias have priorities dating to the early 1700's. Historically, many generations of farmers and ranchers have been sustained by the waters of the Rios Nambé and Pojoaque. The acequias fed by these streams have extended the riparian habitat of the valley and recharged the aquafer that many families draw their well water from. PVID is the steward of the dam and reservoir that provide water to this living community. The Pojoaque Valley water rights are subject to the Aamodt Water Rights Adjudication Settlement.

Our irrigated lands are in jeopardy due to drought and the subdivision of agricultural land. We have many active young farmers producing for the Española, Santa Fe, and other neighboring community farmer's markets. A dependable water supply is crucial to these farms and to support the many acres of historic pasturelands and orchards.

The drought caused water shortage situation would not be resolved by a litigious priority call. The funds spent for potential litigation would be best used developing a sharing agreement, based on solid research into the present and future water needs of our community. Gathering information from the community is essential. Our community is passionate about saving its connection to its irrigable lands.

We do not have the resources needed for planning our water future. The New Mexico Acequia Association (NMAA) and New Mexico Water Resources Research Institute (NM WRRI) can



Pojoaque Valley Irrigation District 9 Cities of Gold Road Santa Fe, New Mexico 87506 (505) 455-2693 Email: pvidistrict1@hotmail.com "Water is Life"



guide our community in forming a science-based water sharing plan. A sound model / map of our acequia systems and communities with an accurate inventory of active water rights and shareholders, will provide essential decision-making tools for water managers and the NM Office of the State Engineer as basin watermaster, well into the future.

Respectfully, The PVID Board of Directors

# Rio Quemado, Rio Frijoles, Rio En Medio and Santa Cruz Stream Systems' Community Ditch Association

Bureau of Reclamation Ms. Sheri Looper Mail Code: MP-400 2800 Cottage Way Sacramento, California 95825

RE: WaterSMART Drought Response Program: Drought Resiliency Projects for Fiscal Year 2023 (DRP)

June 9, 2022

Dear Ms. Looper,

On behalf of Rio Quemado, Rio Frijoles, Rio en Medio, and Rio Santa Cruz Stream Systems' Community Ditch Association (The Association), we are writing to state our strong support for the proposed project entitled "*Regions with Acequias in the Northern Rio Grande and San Juan Basins of New Mexico: Tools for Planning and Adapting Water Sharing Agreements and Implementing Strategies that Increase Water and Community Resilience*," submitted by the New Mexico Acequia Association (NMAA). We are also stating our commitment of collaboration to play a leadership role in the project, participate as members of the regional working groups, and facilitate integrating drought mitigation strategies and response actions into regional planning frameworks.

The timing and the stated objectives of this NMAA project coincide perfectly with our Association's current work and objectives. The purpose of our Association is to protect and defend the water rights of acequias and their individual members in the Rio Quemado, Rio Frijoles, Rio En Medio and Santa Cruz Stream Systems in the water rights suit known as the Santa Cruz River and Rio Truchas Adjudication Suit, U.S. District Court Case Nos. 7844 and 8640, and in any other matters pertaining to acequias.

To the latter, our organization is aimed at protecting all rights of irrigation, including the development of processes for equitable sharing, water stewardship and water-preserving infrastructure and efficiency improvements. The efforts of the NMAA in the project above will help us safeguard sustainable farming and preserve the ecosystem within the Santa Cruz Basin.

The farmers within our watershed are experiencing ever-growing pressure from drought (climate change) and increasing demands (new crops, new users) on our precious limited water resource. Many small-holding farms are being threatened. In a wider

view, the increasing intensity of wildfires in the New Mexico watersheds over the past twenty years have raised concerns that our Santa Cruz watershed is vulnerable.

Individually, our water rights holders do not know what to do or how to join together as a community to coordinate a response to the above problems. Through our work in promulgating information on the Adjudication Suits, we have begun to reach out to provide local water rights owners with information on the lawsuits and the options that face us.

However, there is a critical need in terms of increased communication and organization of all of the stakeholders (city, individual irrigators, pueblos) to plan to create a more resilient agricultural community in the face of our ongoing drought.

The project proposed by NMAA will benefit our community in terms of providing that umbrella organization and providing field and water budget studies, modeling, and tools and strategies for sharing our water.

We strongly support the NMAA application for this funding,

Thank you, Don Bustos

Rio Quemado, Rio Frijoles, Rio en Medio, and Rio Santa Cruz Stream Systems' Community Ditch Association, Board President santacruzacequias@gmail.com 505-309-1168

# Santa Cruz Irrigation District

Bureau of Reclamation Ms. Sheri Looper Mail Code: MP-400 2800 Cottage Way Sacramento, California 95825

RE: WaterSMART Drought Response Program: Drought Resiliency Projects for Fiscal Year 2023 (DRP)

June 9, 2022

Dear Ms. Looper,

On behalf of Santa Cruz Irrigation District (SCID), we are writing to state our strong support for the proposed project entitled "Regions with Acequias in the Northern Rio Grande and San Juan Basins of New Mexico: Tools for Planning and Adapting Water Sharing Agreements and Implementing Strategies that Increase Water and Community Resilience," submitted by the New Mexico Acequia Association. The SCID, with water delivery authority for 23 acequias our basin as the owners and operator of the Santa Cruz Dam, affirms its partnership with the New Mexico Acequia Association. We are also stating our commitment of collaboration to play a leadership role in the project, participate as members of the regional working groups, and facilitate integrating drought mitigation strategies and response actions into regional planning frameworks. We are committed to continued collaboration with the Regional Acequia Association, the Rio Quemado, Rio Frijoles, Rio En Medio Santa Cruz Stream System Community Ditch Association to increase communications with parciantes, improve our watershed and implement viable options to share water and stabilize our water supply given a number of challenges including faster shorter run off periods and increased demand for water in a drying climate. We know that when agriculture can thrive our communities and other water users benefit as well.

The Santa Cruz Irrigation District (SCID) was legally organized November 16, 1925, and is an irrigation district recognized by the State of New Mexico. The SCID includes 23 member acequias, in which the associated landowners also own and operate the Santa Cruz Dam and Reservoir to irrigate approximately 8,000 acres. The elected officers of the SCID collaboratively work with the member acequias to ensure deliveries of water for irrigated agriculture. Seven of the member acequias also include irrigated lands owned by Santa Clara Pueblo and Ohkay Owingeh.

The SCID is significantly affected by the quality and quantity of water in the Rio Santa Cruz Watershed. As water availability seems to diminish and increase in variability, the irrigators we serve want to find strategies to continue farming through droughts and floods. We need high-level decisions impacting water in our basin to be informed by data and a real understanding of the implications new wells, transfers, uses, changes to the landscape, etc. will have on agriculturalist and the ecosystems we depend on. Additionally, we are all eager to implement mechanisms that will increase our water resilience through unpredictable water availability. We need more information and coordination on what to implement and a tool to help us evaluate our own decisions.

The District makes decisions about how much water to release and when. Our decisions, based on water availability affect thousands of farmers and ranchers in our basin as well as the ecologies of the communities we serve and the aquifers that the member acequias recharge. We are interested in seeing a water budget for our basin and considering how that will help us articulate our concerns about potential changes in water use and clarifying what is available. We are most eager for the planning protocol and toolkit that will truly help us think through and develop strategies to ensure that our irrigators continue to grow food for community and steward our lands.

Many thanks for your Consideration,

Ron Gallegos

Ronald Gallegos SCID President jarhead3033@yahoo.com



2022 OFFICERS

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# Taos Valley Acequia Association

Taos County Juan I. Gonzales Agricultural Center 202 Chamisa Road, Suite D Taos, NM 87571 Phone (575) 758-9461 taosacequias@gmail.com

Bureau of Reclamation Ms. Sheri Looper Mail Code: MP-400 2800 Cottage Way Sacramento, California 95825

RE: WaterSMART Drought Response Program: Drought Resiliency Projects for Fiscal Year 2023 (DRP)

June 3, 2022

Dear Ms. Looper,

On behalf of the Taos Valley Acequia Association (TVAA), we are writing to state our strong support for the proposed project entitled "*Regions with Acequias in the Northern Rio Grande and San Juan Basins of New Mexico: Tools for Planning and Adapting Water Sharing Agreements and Implementing Strategies that Increase Water and Community Resilience*," submitted by the New Mexico Acequia Association. We are also stating our commitment of collaboration to play a leadership role in the project, participate as members of the regional working groups, and facilitate integrating drought mitigation strategies and response actions into regional planning frameworks.

The Taos Valley Acequias Association ensures the long-term sustainability of traditional agricultural communities of the Taos Valley by protecting water rights and preserving and strengthening the acequia system. TVAA has faced many challenges due to drought and climate change. In the last few years TVAA has worked with other nonprofit organizations to educate and strategize on ways that our traditional agriculture can adapt to the new revolving ways of agriculture. Through our collaboration we have held four events in the last year on regenerative agriculture and drought resilience. Our acequia have also learned to adapt to water sharing among the streams and the Taos Valley as a whole. This project will benefit the Taos Valley by providing us guidelines of work that is being done in other regions. With this work we are able to see what works and what we need to improve.

The Taos Valley Acequia Association looks forward to working with other partners in this much needed project. If you have any questions, please feel free to contact us.

Thank you, Judy Torres

**Executive** Director

The Taos Valley Acequia Association ensures the long-term sustainability of traditional agricultural communities of the Taos Valley by protecting water rights and preserving and strengthening the acequia system.

Bureau of Reclamation Ms. Sheri Looper Mail Code: MP-400 2800 Cottage Way Sacramento, California 95825

RE: WaterSMART Drought Response Program: Drought Resiliency Projects for Fiscal Year 2023 (DRP)

June 14, 2022

Dear Ms. Looper,

On behalf of the New Mexico Interstate Stream Commission (NMISC), we are writing to state our strong support for the proposed project entitled "*Regions of New Mexico with Acequia Water Distribution Systems: Tools to Adapt to Water Scarcity and Guide Implementation of Strategies to Increase Water and Community Resilience*," submitted by the New Mexico Acequia Association. We are also stating our commitment of collaboration to play a leadership role in the project, participate as members of the regional working groups, and facilitate integrating drought mitigation strategies and response actions into regional planning frameworks. We also commit to \$75,000 annual in in-kind match, which represents 1000 hours at \$75/hr rate, to support work that overlaps with the implementation needs of the NMISC's- 50 Year Water Plan. At this time we expect that the funds will be available for the start and duration of the project April 1, 2023 to March 31, 2026, however funding is subject to yearly budget approvals.

The responsibilities of the NMISC are based in ensuring basin compliance with the eight interstate compacts to which the State is a party. The NMISC has broad powers to investigate, protect, conserve, and plan for New Mexico's water resources. As the Program Manager for the State Water Planning Program, my role includes planning for New Mexico's water resilience with the anticipated impacts of climate change, and I will facilitate the coordination with our regional basin managers.

Acequia irrigation has been part of the culture and landscape of Northern New Mexico since it was part of the Spanish empire, through the period of Mexican governance of the state, and throughout the history of the United States. Scientific work conducted in 2021 to evaluate the likely impacts of climate change identified numerous vulnerabilities to the continuing viability of traditional acequia agriculture posed by climate change. Ongoing wildfires in the state as of this writing highlight the vulnerability of the landscape and communities supported by acequia irrigation.

The proposed project meets a critical need for the NMISC planning program, which is working to complete a 50-Year Water Plan based on the reduced water availability projected for climate change. The proposed assessment of lessons learned through generations of acequia agriculture and water sharing traditions and governance structures will improve New Mexico's resilience by putting the expertise of New Mexico's families and communities at the forefront of efforts to adapt. Public outreach conducted in support of ongoing planning wok illustrates the importance of utilizing traditional solutions to improve water management statewide. Ongoing forest fires exacerbate the need for emergency response and provide an opportunity to explore, archive, and evaluate best practices for improving the effectiveness of emergency response actions.

On behalf of the NMISC, I am writing in support of the New Mexico Acequia Association's proposal.

Sincerely,

Under Coal

Andrew Erdmann State Water Planning Program Manager New Mexico Interstate Stream Commission



New Mexico Bureau of Geology & Mineral Resources A DIVISION OF

NEW MEXICO INSTITUTE OF MINING & TECHNOLOGY 801 Leroy Place Socorro, NM 87801-4796

575-835-5490 Office/575-835-6333 Fax

Bureau of Reclamation Ms. Sheri Looper Mail Code: MP-400 2800 Cottage Way Sacramento, California 95825

RE: WaterSMART Drought Response Program: Drought Resiliency Projects for Fiscal Year 2023 (DRP)

June 7, 2022

Dear Ms. Looper,

On behalf of New Mexico Bureau of Geology and Mineral Resources, I am writing in support for the proposed project entitled "*Regions of New Mexico with Acequia Water Distribution Systems: Tools to Adapt to Water Scarcity and Guide Implementation of Strategies to Increase Water and Community Resilience*," submitted by the New Mexico Acequia Association. I also would like to express my commitment of collaboration as a representative working directly on the New Mexico Water Data Initiative to participate in the advisory committee developed for this project.

The New Mexico Bureau of Geology and Mineral Resources is the state geologic survey for New Mexico. It is named as the convening agency of the NM Water Data Act, passed into statute in 2019, requiring state agencies with water data to open water data in standardized formats. In the years since adoption of the New Mexico Water Data Act, our efforts have helped illuminate numerous datasets and gaps in data collection, which may be quite relevant to the acequia communities and this proposal. This project would also provide a project driven use case for water data, which could provide a very useful learning experience for state agency collaborators. Data in itself cannot solve our water management challenges. However, having more direct access to dynamic, real time data will inform our decision making, making our use of the data more efficient as we build resilience and establish preventative measures to reduce the need for emergency response actions.

Additionally, time spent on this project by staff of the NM Bureau of Geology / NM Water Data Initiative will be offered as cost match. We can project a cost match for the proposed project period (April 1, 2023 to March 31, 2026) of at least \$10,890 of non-federal funding. The table included may be used for estimation purposes and modified as needed pending award.

In-Kind Cost Match - NM Ace	quia Association	proposal (with WRRI)	
2023-2026 years			
Staff title	Rate est.	Hours est.	Cost
Water Data Program Manager	36	80	\$2,880
Water Data Director	46	60	\$2,760
		Fringe estimate (55.97%)	\$3,157
		Subtotal	\$8,797
		Overhead (23.8%)	\$2,094
		TOTAL	\$10,890

Please consider supporting the funding needs of this proposed project, as we face a future of greater challenges and water scarcity, we will need quick and efficient access to these data more than ever. Thank you for your consideration, and feel free to reach out to me with any questions.

Kind regards,

Jacq In

**Stacy Timmons** 

Associate Director, Hydrogeology Programs Convener of Water Data Act New Mexico Bureau of Geology & Mineral Resources New Mexico Institute of Mining & Technology 575-835-6951; Stacy.Timmons@nmt.edu



#### DEPARTMENT OF AGRICULTURE STATE OF NEW MEXICO

MSC 3189, Box 30005 Las Cruces, New Mexico 88003-8005 Telephone (575) 646-3007

MICHELLE LUJAN GRISHAM Governor

JEFF M. WITTE Secretary

June 9, 2022

Bureau of Reclamation Ms. Sheri Looper Mail Code: MP-400 2800 Cottage Way Sacramento, California 95825

RE: WaterSMART Drought Response Program: Drought Resiliency Projects for Fiscal Year 2023 (DRP)

Dear Ms. Looper,

On behalf of the New Mexico Department of Agriculture (NMDA), we are writing to state our strong support for the proposed project entitled "*Regions of New Mexico with Acequia Water Distribution Systems: Tools to Adapt to Water Scarcity and Guide Implementation of Strategies to Increase Water and Community Resilience*," submitted by the New Mexico Acequia Association. We are also stating our commitment of collaboration to play a support role in the project, participate as possible in regional working groups, and facilitate the integration of drought mitigation strategies and response actions into regional planning frameworks as relevant to NMDA. We also commit to \$30,000 in total in-kind match which represents a percentage of staff time once the particular staff is identified. The funds will be available for the start and duration of the project from April 1, 2023, to March 31, 2026.

NMDA is a constitutional agency established at New Mexico State University. Relevant programs by which NMDA can support this proposal include the administration of the Soil and Water Conservation Commission and the assistance of the state's soil and water conservation districts. NMDA funds acequias and community ditches through the implementation of the Acequia and Community Ditch Fund. NMDA also has statutory authority for the implementation of the Healthy Soil Program, which supports the implementation of on-the-ground soil health grants, related research, and outreach with the goal of improving soil and associated water resources.

NMDA supports the critical need for the expected project results which are purported to improve water management and build long-term resilience to drought; this will be accomplished by participation in and outcomes from the regional working groups to collaboratively build strategies supported by the proposed tools to facilitate the creation and implementation of flexible water sharing and resilience strategies throughout New Mexico, with a focus upon the Northern Rio Grande and San Juan Basins of New Mexico.

Sincerely, eff M. Witte



Bureau of Reclamation Ms. Sheri Looper Mail Code: MP-400 2800 Cottage Way Sacramento, California 95825

RE: WaterSMART Drought Response Program: Drought Resiliency Projects for Fiscal Year 2023 (DRP)

June 13<sup>th</sup>, 2022

Dear Ms. Looper,

On behalf of the New Mexico Water Resources Research Institute (NM WRRI), we are writing to state our strong support for the proposed project entitled "*Regions of New Mexico with Acequia Water Distribution Systems: Tools to Adapt to Water Scarcity and Guide Implementation of Strategies to Increase Water and Community Resilience*," submitted by the New Mexico Acequia Association (NMAA). We are also stating our commitment of collaboration and services if funded to support NMAA in facilitating the regional working and advisory groups, develop the online decision-support water budget modeling tools including integration of additional data, use the model to estimate the effects of the stakeholder-identified drought mitigation strategies to improve water management, and support the efforts to integrate the strategies into regional planning frameworks. As a consultant for this project requesting funding for \$1,163,549.63, we commit \$972,659.63 of in-kind support should the project be funded, which represents salaries and fringe, travel, supplies, graduate tuition, and graduate health insurance for project personnel.

The funds from non-federal and state appropriated sources will be available for the start and duration of the project April 1, 2023, to March 31, 2026. Funding will be spent in accordance with University Policies and Procedures. The overall mission of the NM WRRI is to develop and disseminate knowledge that will assist the state and nation in solving water problems. We are authorized by the section 104 of the Water Resources Research Act of 1984, similar to the Soil and Water Resources Conservation Act of 1977. In addition to funding student and faculty research conducted to address water problems critical to New Mexico and the Southwest, NM WRRI also undertakes watershed-scale restoration planning and implementation, with a focus on working with water managers, in particular irrigation managers, farmers, ranchers, and agencies, to build landscape-scale environmental resources, address the water issues for the arid and semi-arid Southwest, and support long-term resiliency.

NM WRRI spearheaded the development of the New Mexico Dynamic Statewide Water Budget (NM DSWB), as well as the first NM DSWB Regional Water and Community (RegWaC) model.



The first RegWaC model was for the southern New Mexico Lower Rio Grande Water Planning Region in a project supported by an NMSU Cooperative Agreement with Reclamation (Grant No. R16AC00002), and is being further developed as a drought mitigation decision support tool in another project under this Reclamation Drought Resiliency Program (Grant No. R21AP10035). This proposed project benefits from this critical initial work, and furthers the stated-goals of NMSU Cooperative Agreement project for the development of the ability for these regional models to be scalable and transferable. We recognize how critical water budget assessments are to understanding regional dynamics, but also how stakeholder-led processes and the integration of key indicators such as socio-economic factors are required for the information to be useful for water managers. We are excited to support NMAA to collaborate with other water users and policy makers to make the most out of water supplies in a more arid climate and for more equitable water sharing.

Best regards,

Alexander Fernald Professor and Director NM Water Resources Research Institute 575-646-4337 www.wrri.nmsu.edu

for

Alisha A. Giron, Asst. VP, Research Admin. Regents of New Mexico State University 575-646-1590 ras@nmsu.edu



Department of Plant & Environmental Sciences MSC 3Q New Mexico State University P.O. Box 30003 Las Cruces, NM 88003-8001 Tel: 575-646-2974 Fax: 575-646-6041 Email: dwdubois@nmsu.edu

June 14, 2022

Dear Ms. Loper:

As the State Climatologist I are writing to state my strong support for the proposed project entitled "Regions of New Mexico with Acequia Water Distribution Systems: Tools to Adapt to Water Scarcity and Guide Implementation of Strategies to Increase Water and Community Resilience," submitted by the New Mexico Acequia Association. I am also stating my commitment of collaboration to play a leadership role in the project as a member of their advisory committee, participate in the regional working groups, and facilitate integrating drought mitigation strategies and response actions into regional planning frameworks.

As New Mexico's State Climatologist since 2010, I regularly work with agencies and individuals to advise, assess and coordinate studies and programs on topics of climate change, agriculture, and water management. As the Chair of the New Mexico Drought Monitoring Work Group, I have observed the impacts of drought over the state for more than ten years and there is a great need for building of decision support capacity in our rural communities. This proposal is very timely as we need to build resilience in our agricultural systems across the Northern Rio Grande and San Juan Basins of New Mexico from what we know about the climate and help our water managers and producers use this information. I look forward to participating in this project if it gets funded.

Sincerely,

David W. DuBois, Ph.D. New Mexico State Climatologist College Associate Professor



# UNIVERSITY OF BERGEN

Department of Geography

Bureau of Reclamation Ms. Sheri Looper Mail Code: MP-400 2800 Cottage Way Sacramento, California 95825

RE: WaterSMART Drought Response Program: Drought Resiliency Projects for Fiscal Year 2023 (DRP)

June 10, 2022

Dear Ms. Looper,

I am writing to state my strong support for the proposed project entitled "*Regions of New Mexico with Acequia Water Distribution Systems: Tools to Adapt to Water Scarcity and Guide Implementation of Strategies to Increase Water and Community Resilience*," submitted by the New Mexico Acequia Association. I commit to collaboration as a member of the advisory committee for this project.

I have been working with the team members of the New Mexico Water Resources Research Institute for five years on fruitful systems science research integrating water and socioeconomic factors meaningful for agricultural systems throughout New Mexico. I mentored both Dr. Connie Maxwell and Dr. Yining Bai on both systems science and system dynamics modeling, spearheaded and helping to further develop the Southern New Mexico Rio Grande regional system dynamics model.

The work proposed in this project is critical for addressing the drought challenges facing small farmers in this semi-arid part of New Mexico. Central to my research has been the fundamental need for planning to understand long range dynamics, and water users need to be able to not only preserve their productivity, but also improve their water management through further developing their water sharing approaches and implementing long range resilience strategies that support their goals, for example as high-value solutions for that can support the next generation of acequia farmers to produce healthy products and food for their communities and be able to pass these lands onto their children.

I have joined the University of Bergen, Norway, this summer, and become part of the exciting systems science research on resilience and food systems there, particularly with my colleague Dr. Birgit Kopainsky, but plan to continue my collaboration with this team, and am excited to be on the advisory board of this project.

Please do not hesitate to contact me if you have any questions or need more information.

Sincerely yours,

Lagorifi

Saeed P. Langarudi, Associate Professor of System Dynamics

Address: Fosswinckelsgt. 6 5007 Bergen NORWAY Home page: www.uib.no/geografi E-mail: saeed.langarudi@uib.no



New Mexico Rural Water Association 6808 Academy Pkwy E NE, #C1, ALBUQUERQUE, NM 87109

505.884.1031 • 800.819.9893 • FAX 505.884.1032 • www.nmrwa.org

Bureau of Reclamation Ms. Sheri Looper Mail Code: MP-400 2800 Cottage Way Sacramento, California 95825

RE: WaterSMART Drought Response Program: Drought Resiliency Projects for Fiscal Year 2023 (DRP)

June 6, 2022

Dear Ms. Looper:

On behalf of the New Mexico Rural Water Association (NMRWA), we are writing to state our strong support for the proposed project entitled "Regions of New Mexico with Acequia Water Distribution Systems: Tools to Adapt to Water Scarcity and Guide Implementation of Strategies to Increase Water and Community Resilience," submitted by the New Mexico Acequia Association. We are also stating our commitment of collaboration to play a leadership role in the project, participate as members of the regional working groups, and facilitate integrating drought mitigation strategies and response actions into regional planning frameworks.

The New Mexico Rural Water Association (NMRWA) is a non-profit organization with over 480 water and wastewater system members. We represent over 1,297,000 New Mexicans. NMRWA partners with community utilities across the state to create sustainable systems and build local expertise, providing the leadership, technical assistance, and training that local utility professionals count on to provide consistent services and "Quality on Tap" to rural New Mexico families. NMRWA's Source Water Protection Program is a voluntary program that identifies potential risks to drinking water, educates stakeholders, and implements best management practices to protect invaluable water resources. Source water protection planning can include contingency and emergency response plans, watershed protection plans, drought mitigation plans, and community outreach activities.

New Mexico's acequias and rural public water systems are essential for maintaining the character and culture of New Mexico. They provide the water that sustains our traditional communities. Many rural water systems in the Northern Rio Grande and San Juan Basins of New Mexico rely on a single water source, have limited resources, and aging infrastructure. Drought and other extreme weather conditions exacerbate these susceptibilities and challenge their ability to persist and thrive.



The need to better manage our water resources is critical. New Mexico's rural farmers hold a knowledge and understanding of their land and water that must play an essential role in developing sustainable and resilient strategies to water scarcity. NMRWA considers the collaborative approaches in this proposal—using regional working groups to develop strategies of improved water management and build long-term resilience to drought—an effective and exciting approach to developing the water management tools that are essential if New Mexico's communities are to respond to water scarcity with sustainable strategies and reduce the need for emergency response actions.

NMRWA is pleased to support and participate in this important work. Sincerely,

Martha Suchan

Martha Graham Source Water Protection Specialist





INTERA Incorporated 2440 Louisiana Blvd. NE, Suite 700 Albuquerque, NM 87110 USA 505.539.8100

June 13, 2022

Dr. Sam Fernald Director New Mexico Water Resources Research Institute (NM WRRI) New Mexico State University MSC 3167 PO Box 30001 Las Cruces, NM 88003-8001

# RE: WaterSMART Drought Response Program: Drought Resiliency Projects for Fiscal Year 2023 (DRP)

Dear Dr. Fernald,

On behalf of INTERA Incorporated (INTERA), we are writing to state our commitment to scope for the proposed project entitled, *"Regions of New Mexico with Acequia Water Distribution Systems: Tools to Adapt to Water Scarcity and Guide Implementation of Strategies to Increase Water and Community Resilience,"* submitted by the New Mexico Acequia Association. INTERA will provide consultant services to support the New Mexico Water Resources Research Institute (NM WRRI) in the development and implementation of the decision-support model and its on-line application. If awarded, INTERA commits to the scope and total cost estimate of \$240,000, which will be broken out into \$80,000 annual amounts for the duration of the project period of April 1, 2023 to March 31, 2026.

INTERA is uniquely qualified to support NM WRRI with the proposed project. Austin Hanson, a geologist with INTERA, has worked on NM WRRI's Dynamic Statewide Water Budget since 2017. Additionally, INTERA provided similar services to the Albuquerque Bernalillo County Water Utility Authority's "*Water 2120: Securing Out Water Future*" project, which modeled multiple water demand scenarios and conservation strategies to provide water managers with a road map for action. INTERA is pleased to be included with this proposed project, and if awarded, will be a steward of water and community resilience in New Mexico's acequia regions.

Sincerely,

**INTERA** Incorporated

othe North

Austin Hanson Geologist, Project Manager

David Jordan, PE, D.WRE Vice President, Western Region