

**TIER-1 APPLICATION TO THE NEW MEXICO INTERSTATE STREAM COMMISSION  
FOR NEW MEXICO UNIT OR WATER UTILIZATION ALTERNATIVE  
UNDER THE ARIZONA WATER SETTLEMENTS ACT**

<b>1. Legal Name:</b> <b>Douglas S. Cram &amp; Carlos G. Ochoa</b>	<b>2. Organization:</b> <b>New Mexico State University</b>			
<b>3. Address (street, city, county, state, and zip code):</b>  <b>PO Box 30003, MSC 3AE Las Cruces, NM 88003</b>	<b>4. Name, email, and phone number of contract person:</b>  <b>Dr. Douglas Cram, dcram@nmsu.edu, (575)646-8130 Dr. Carlos Ochoa, carochoa@nmsu.edu, (575)646-5558</b>			
<b>5. TYPE OF APPLICATION (check one):</b> <input checked="" type="checkbox"/> Final <input type="checkbox"/> Preliminary for review <input type="checkbox"/> Revised	<b>6. TYPE OF APPLICANT (CHECK BOX):</b> <input type="checkbox"/> local governments or municipalities  <input type="checkbox"/> soil and water conservation districts, irrigation districts or commissions, acequias, or other political subdivision of the State of New Mexico  <input checked="" type="checkbox"/> institutions of higher education or a consortium of such institutions  <input type="checkbox"/> non-profit organizations or associations  <input type="checkbox"/> private individual/s  <input type="checkbox"/> federal agency (ies)  <input type="checkbox"/> Other (specify)			
<b>7. BRIEF PROJECT DESCRIPTION:</b> We propose a paired-watershed management project that will potentially increase water yield and contribute to meeting existing and future water demands in the region. This project will also generate critical knowledge and understanding of the hydrologic response following silvicultural treatments in the Gila Basin. Increasing water yield to meet an ever growing water demand and increasing knowledge of watershed processes will be beneficial and useful for New Mexico stakeholders in the Gila Basin and beyond.	(Continuation of 6. TYPE OF APPLICANT)			
<b>8. AREAS AFFECTED (describe by county, municipality, township, etc. as applicable):</b> Our proposal is designed to be conducted entirely on USDA Forest Service lands within Catron and Grant counties.	(Continuation of 6. TYPE OF APPLICANT)			
<b>9. TOTAL FUNDING REQUESTED (in \$1,000):</b>				
2012: 750	2013: 500	2014: 375	2015: 375	2016: 800
2017: 240	2018: 240	2019: 240	2020: 240	2021: 240
<b>10a. TO THE BEST OF MY KNOWLEDGE AND BELIEF, ALL DATA IN THIS APPLICATION ARE TRUE AND CORRECT, THE DOCUMENT HAS BEEN DULY AUTHORIZED BY THE GOVERNING BODY OF THE APPLICANT AND THE APPLICANT WILL COMPLY WITH THE ATTACHED REQUIREMENTS AND ASSURANCES IF THE PROPOSAL IS ACCEPTED.</b>				
<b>10b. TYPED OR PRINTED NAME OF AUTHORIZED REPRESENTATIVE:</b> Douglas S. Cram Carlos G. Ochoa	<b>11. TITLE:</b> College Assistant Professor Research Assistant Professor	<b>12. PHONE NUMBER:</b> 575-646-8130 575-646-5558		
<b>13. SIGNATURE:</b> /S/ Douglas S. Cram /S/ Carlos G. Ochoa			<b>DATE:</b> 6/28/2011	

#### 14. Evaluation criteria.

*A. State whether the proposal is for the “New Mexico Unit,” a “water utilization alternative,” or both.*

Our watershed management proposal designed to increase water yield and knowledge of hydrological processes following silvicultural treatments is a water utilization alternative. The proposal does not call for developing additional water from the Gila basin, and is therefore not a New Mexico Unit proposal.

*B. Describe how the proposal will meet a “water supply demand” in the Southwest New Mexico Water Planning Region, comprised of Catron, Grant, Hidalgo and Luna Counties.*

Our proposal has the potential to meet a water supply demand by increasing water yield in upper (ponderosa pine/mixed conifer) and lower (pinyon-juniper) elevation watersheds following silvicultural treatments. Current and future water demands in the region including public, commercial, and agricultural demands all rely and benefit from water discharged from the Gila watershed. Watershed management has been identified as an appropriate tool to increase water supply, protect and improve water quality, and generally improve the overall condition of the watershed. Silvicultural treatments such as tree thinning and prescribed fire have been shown to increase the resilience of forest and woodlands across the Southwest (Cram et al. 2006). This approach to meeting the water supply demand of the region is economically and institutionally feasible, enhances the water resources of the area, as well as improves the quality of life in the region.

Our proposal calls for a paired watershed approach where silvicultural prescriptions will be designed to reduce stem densities to historic levels in forests and woodlands in the Gila Basin. Current conifer stem densities in forests and woodlands are outside of the historic range on natural variability resulting in reduced water yields and an increased risk for large acreage crown fire. Studies have shown that silvicultural treatments that reduce overstory densities can provide significant amounts of water yield. Baker (1986) reported water yield increases up to 3.9 inches, or 63%, in the first year following overstory removal in a ponderosa pine watershed in Arizona. Baker et al. (1984) also reported annual streamflow increases of 157% following pinyon-juniper mortality in an Arizona woodland following treatment. In addition, a study conducted by Deboodt et al. (2008) showed late spring flow increases of up to 225%, an increase in the number of days of recorded groundwater, and an increase of late season soil moisture following juniper reduction in a watershed in Oregon with 13 inches of annual precipitation. Treated watersheds also promote an increase in soil moisture, in shallow groundwater recharge, and in infiltration due to increased herbaceous cover which in turn can help reduce hillslope erosion.

Detailed understanding of how silvicultural treatments impact water yield, particularly the magnitude of effect under various spatial and temporal scales, remains of great interest and value to New Mexico stakeholders. By increasing our understanding of how watershed processes

function in the Gila Basin, stakeholders will be better equipped to manage for existing water supply demands and those of the future.

*C. Describe how the proposal considers the Gila environment and describe how any negative impacts might be mitigated.*

Our proposal will utilize a silvicultural plan that requires the use of best management practices specifically designed to mitigate any negative impacts to the environment. Best management practices are the most effective and practical means of controlling point and nonpoint source pollutants at levels compatible with environmental quality goals. The state of New Mexico via State Forestry has published an extensive handbook on best management practices which includes explicit implementation details recommend to be used on any forest treatment project.

Specific silvicultural prescriptions for forests and woodlands will be developed in close coordination with the Forest Service and based on management objectives compatible to the Gila basin. On-site monitoring will be implemented during silvicultural operations to insure implementation plans and goals are being achieved. In the event of an unforeseen event, predetermined mitigation actions as guided by best management plans will be implemented to minimize environmental impacts.

Our proposal is designed to be conducted entirely on USDA Forest Service lands within Catron and Grant counties. All significant actions, which include forest and woodland restoration treatments, on federal lands must be compliant with the National Environmental Protection Act (NEPA). The NEPA process is proactive and specifically designed to mitigate any potential negative environmental impacts to federal lands. The NEPA process considers an exhaustive list of potential environmental impacts to water quality, wildlife species and their habitats, soils, vegetation including sensitive species, and even archeological sites. Working in close collaboration with the Forest Service, we will assist with the NEPA process as necessary. We have field and NEPA experience, which if called upon, will be implemented to help facilitate the regulatory process.

*D. Describe how the proposal considers the historic uses of and future demands for water in the Southwest New Mexico Water Planning Region and the traditions, cultures and customs affecting those uses.*

Demands for water in the arid Southwest have been a fact of life for as long as humans have inhabited the region. In fact, many of the historical demands for water such as public consumption, commercial (industrial, mining, and power), and agriculture will continue to represent the water demands of the future. The intensity of this demand will depend on factors such as population growth and climate variability. Our proposal is cognizant of these multiple water demands and the ever present need for increased water yield. Moreover, our proposal recognizes that the traditions, cultures, and customs of this region are largely dependent on the surrounding natural resources. Sound management of these natural resources is paramount for

their survival, and can be best achieved with increased knowledge of ecosystem function. Comprehensive watershed management can lead to enhancement of surface recharge, aquifer storage, and recovery of Gila River flows as outlined in the Southwest New Mexico Regional Water Plan (NMOSE 2011).

#### Literature Cited

Baker, M.B., Jr. 1984. Changes in streamflow in an herbicide-treated pinyon-juniper watershed in Arizona. *Water Resources Research* 20:1639–1642.

Baker, M.B., Jr. 1986. Effects of ponderosa pine treatments on water yield in Arizona. *Water Resources Research* 22:67–73.

Cram, D., T. Baker, and J. Boren. 2006. Wildland fire effects in silviculturally treated vs. untreated stands of New Mexico and Arizona. Research Paper RMRS-RP-55. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 28 p.

Deboodt, T.L. 2008. Watershed response to Western Juniper control. Oregon State University. Ph.D. dissertation. Corvallis, OR. 156 p.

NMOSE. 2011. New Mexico Office of the State Engineer: Region 4. Southwest New Mexico Regional Water Plan. [Online]. Available at [http://www.ose.state.nm.us/isc\\_regional\\_plans4.html](http://www.ose.state.nm.us/isc_regional_plans4.html). (Accessed 23 June 2011).