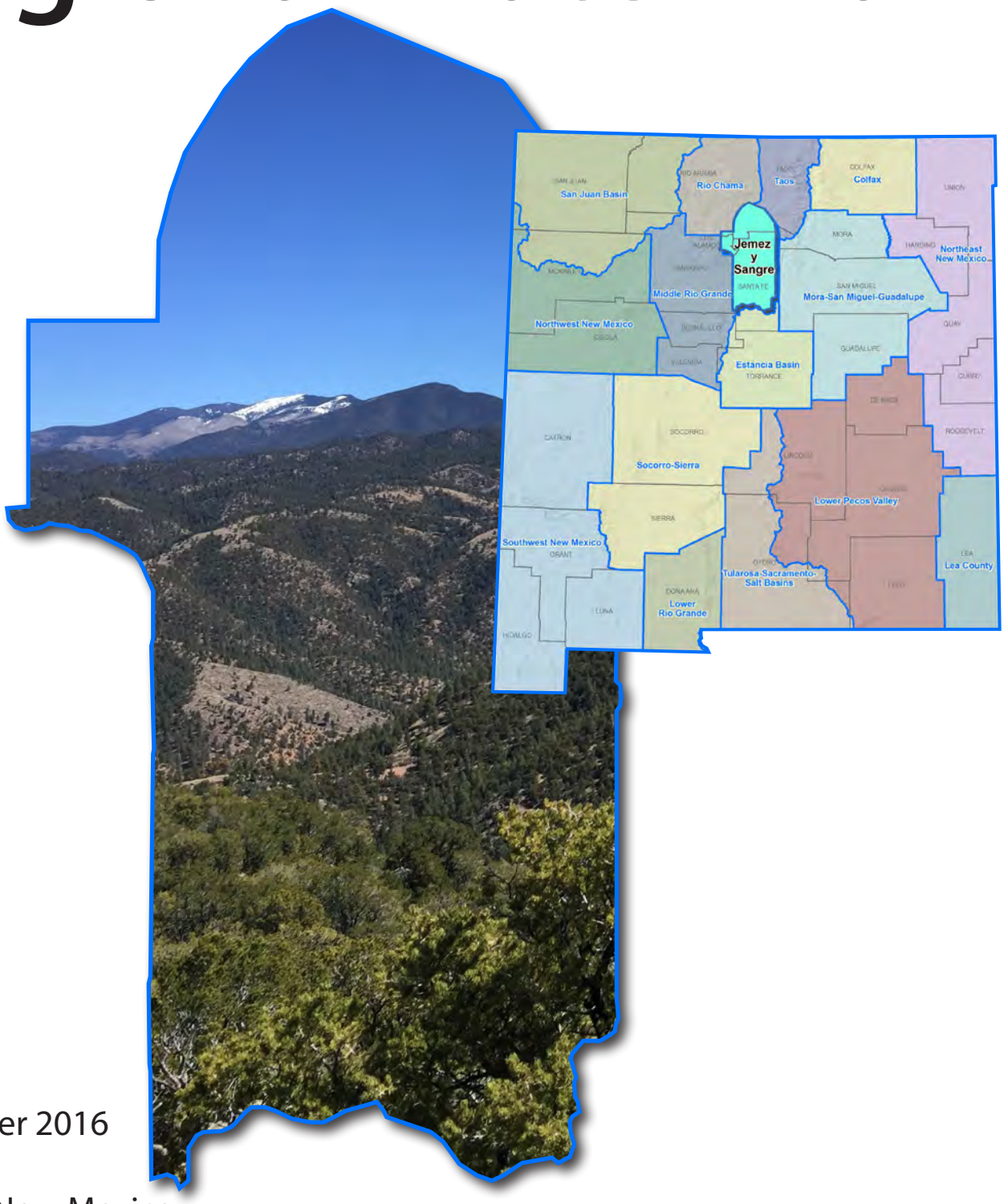
Jemez y Sangre Regional Water Plan



November 2016

State of New Mexico
Interstate Stream Commission
Office of the State Engineer

Cover photograph: Santa Fe watershed

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Note: Appendix designations indicate corresponding section in plan

List of Acronyms

ac-ft/yr	acre-feet per year
AMO	Atlantic multidecadal oscillation
AWRM	Active Water Resource Management
BBER	Bureau of Business and Economic Research
BDD	Buckman Direct Diversion
BLM	Bureau of Land Management
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFRP	Collaborative Forest Restoration Program
CID	Carlsbad Irrigation District
CWA	Clean Water Act
DBS&A	Daniel B. Stephens & Associates, Inc.
DWS	Domestic Well Statute
EBTAG	Española Basin Technical Advisory Group
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
EBID	Elephant Butte Irrigation District
EBRIF	Española Basin Regional Issues Forum
EPCWID #1	El Paso County Water Improvement District Number One
FEMA	Federal Emergency Management Agency
FY	fiscal year
GIS	geographic information system
gpcd	gallons per capita per day
GWQB	Ground Water Quality Bureau [New Mexico Environment Department]
ICIP	Infrastructure Capital Improvement Plan
IPCC	Intergovernmental Panel on Climate Change
JySWPC	Jemez y Sangre Water Planning Council
LANL	Los Alamos National Laboratory
LQ	location quotient
MCL	maximum contaminant level
MCLG	maximum contaminant level goal

MDWA	mutual domestic water association
MDWCA	mutual domestic water consumers association
mgd	million gallons per day
MRGCD	Middle Rio Grande Conservancy District
MRGESCP	Middle Rio Grande Endangered Species Collaborative Program
MSGP	Multi-Sector General Permit
NASS	National Agricultural Statistics Service
NCDC	National Climatic Data Center
NMAC	New Mexico Administrative Code
NMBGMR	New Mexico Bureau of Geology & Mineral Resources
NMED	New Mexico Environment Department
NMISC	New Mexico Interstate Stream Commission
NMOSE	New Mexico Office of the State Engineer
NMSA	New Mexico Statutes Annotated
NMSU	New Mexico State University
NMWQCC	New Mexico Water Quality Control Commission
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
N-P-T	Nambe-Pojoaque-Tesuque
NRCS	Natural Resources Conservation Service
NWS	National Weather Service
PDO	Pacific decadal oscillation
PDSI	Palmer Drought Severity Index
PPP	project, program, and policy
PVACD	Pecos Valley Artesian Conservancy District
RWP	regional water plan
SDWA	Safe Drinking Water Act
SGMP	*Santa Fe County Sustainable Growth Management Plan*
SJC	San Juan-Chama Project
SNOTEL	snowpack telemetry
SWCD	soil and water conservation district
TDS	total dissolved solids
TMDL	total maximum daily load
U.S. EPA	U.S. Environmental Protection Agency
UNM	University of New Mexico

USBR	U.S. Bureau of Reclamation
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGCRP	U.S. Global Change Research Program
USGS	U.S. Geological Survey
UST	underground storage tank
UWB	underground water basin
WBP	watershed based plan
WQA	Water Quality Act (New Mexico)
WRCC	Western Regional Climate Center
WRAS	Watershed Restoration Action Strategy
WSD	Water and Sanitation District
WUA	water users association
WWTP	wastewater treatment plant

Executive Summary

The Jemez y Sangre Water Planning Region, which includes primarily the northern two-thirds of Santa Fe County, all of Los Alamos County, and the southeastern part of Rio Arriba County (Figure ES-1), is one of 16 water planning regions in the State of New Mexico. Regional water planning was initiated in New Mexico in 1987, its primary purpose being to protect New Mexico's water resources and to ensure that each region is prepared to meet future water demands. Between 1987 and 2008, each of the 16 planning regions, with funding and oversight from the New Mexico Interstate Stream Commission (NMISC), developed a plan to meet regional water needs over the ensuing 40 years. The *Jemez y Sangre Regional Water Plan* was completed and accepted by the NMISC in 2003. Two subsequent updates to the regional water plan (RWP) were prepared in 2007 and 2009 to address selected issues for which updated information was available.

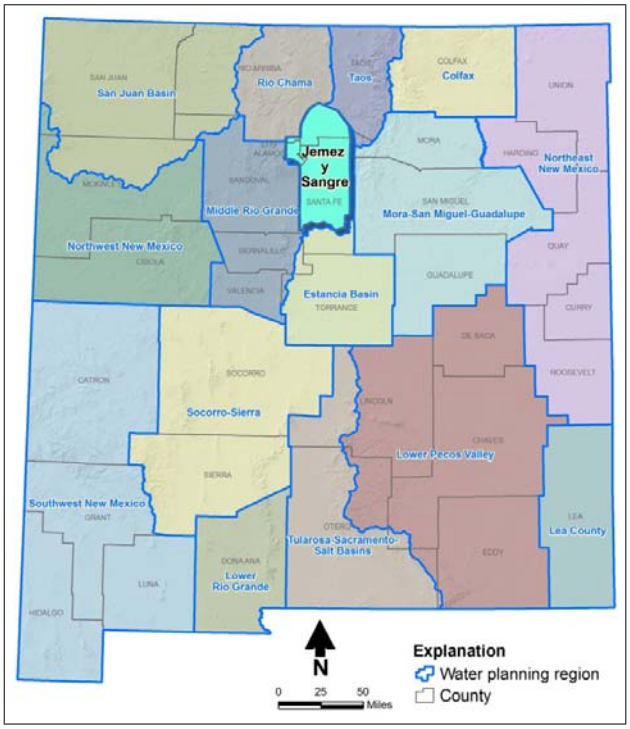


Figure ES-1. Jemez y Sangre Water Planning Region

The purpose of this document is to provide new and changed information related to water planning in the Jemez y Sangre region and to evaluate projections of future water supply and demand for the region using a common technical approach applied to all 16 planning regions statewide. Accordingly, the 2016 Jemez y Sangre RWP summarizes key information in the 2003 plan and the 2007 and 2009 updates and provides updated information regarding changed conditions and additional data that have become available.

Based on updated water demand (Figure ES-2) data from 2010, Figure ES-3 illustrates the total projected regional water demand under high and low demand scenarios from 2010 to 2060, and also shows the administrative water supply and the drought-adjusted water supply. The administrative water supply is based on 2010 withdrawals of water and is an estimate of future water supplies that considers both physical availability and compliance with water rights policies. The future water demand is projected to grow from about 90,500 acre-feet in 2010 to between 94,500 and 104,000 by 2060. Thus, the increased demand in water beyond the amount diverted in 2010 is estimated to be between about 4,000 and 13,500 ac-ft/yr. In 2010, agricultural water use amounted to 66,000 acre-feet of withdrawals and the remaining 24,500 acre-feet of withdrawals were for all other water use categories. The estimated gap between supply and demand in a drought scenario ranges from 46,072 to 55,640 acre-feet over

the planning period, primarily impacting the agricultural water users, who are almost entirely dependent on surface water.

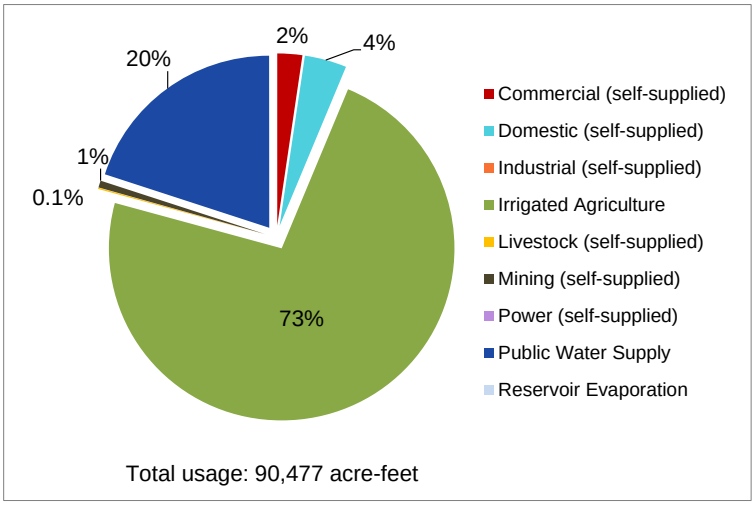


Figure ES-2. Total Regional Water Demand, 2010

Note: Tribes and Pueblos in New Mexico are not required to provide water use data to the State. Therefore, tribal water use data are not necessarily reflected in this figure.

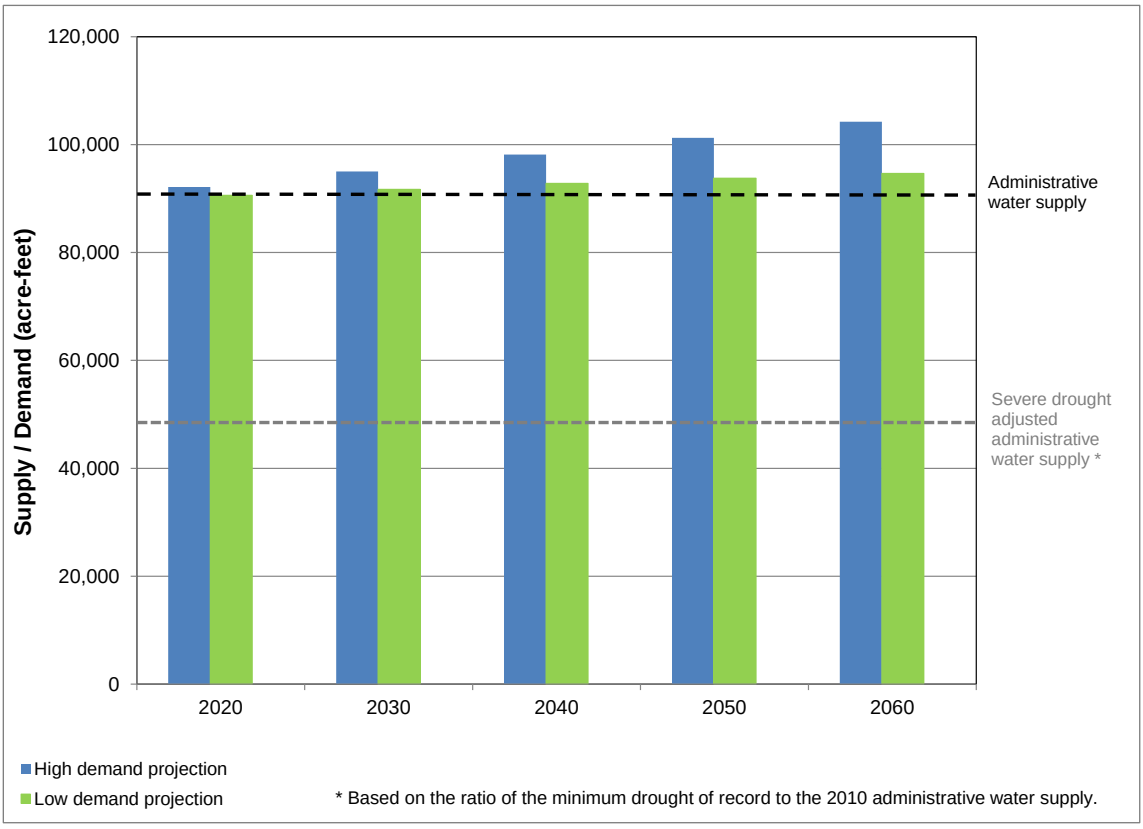


Figure ES-3. Available Supply and Projected Demand

Note: Tribes and Pueblos in New Mexico are not required to provide water use data to the State. Therefore, tribal water use data are not necessarily reflected in this figure.

The 2003 RWP only addressed the gap between supply and demand for the non-agricultural categories. The region estimates that the 2003 RWP-projected gap of about 32,000 acre-feet in 2060 for the public water supply (non-agricultural demands) of the Jemez y Sangre region has been reduced by 41 percent through water conservation, revised growth projections, transfers of agricultural water, increased diversion of San Juan-Chama project water, and the drilling of new domestic wells.

The gaps in supply and demand illustrated in Figure ES-3, especially the large gap under the drought-adjusted supply, provide a rough approximation of the vulnerability of water supply to drought for the region, but the situation is much more complex. The gap in supply and demand is not distributed evenly over the region or water use categories. Each public water system and acequia knows the limits and flexibility available in managing the projected demands. Some systems are more vulnerable to drought than others. The agricultural category relies almost entirely on surface water, but the vulnerability to drought varies. The irrigators without water storage and those that rely on the tributaries to the Rio Grande are most vulnerable. The farmers that divert directly from the Rio Grande are the least vulnerable because their water demands are much less than the minimum flow recorded in the over-100-year record.

The City of Santa Fe was extremely vulnerable to drought at the time the 2003 RWP was prepared, because about 40 percent of its supply was from the Santa Fe River, which was not able to meet the demands during drought years. This situation has changed dramatically since that time. The City is now able to divert San Juan-Chama Project water directly from the Rio Grande through the Buckman Direct Diversion (BDD) Project when surface water is available. The water levels in wells at and near City well fields have recovered significantly since the BDD project came on-line because the surface water provided by the BDD and Santa Fe River has been sufficient to meet most demands, saving the aquifer for drought periods.

Planning Method

For the 2016 Jemez y Sangre RWP, water supply and demand information was assessed in accordance with a common technical approach, as identified in the *Updated Regional Water Planning Handbook: Guidelines to Preparing Updates to New Mexico Regional Water Plans* (where it is referred to as a common technical *platform*) (Handbook). This common technical approach outlines the basis for defining the available water supply and specifies methods for estimating future demand in all categories of water use:

- The method to estimate supply (referred to as the *administrative water supply* in the Handbook) is based on withdrawals of water as reported in the *New Mexico Water Use by Categories 2010* report prepared by the New Mexico Office of the State Engineer (NMOSE). Use of the 2010 data provides a measure of supply that considers both physical supply and legal restrictions (i.e., the water is physically available for

withdrawal, and its use is in compliance with water rights policies) and thus reflects the amount of water available for use by a region.

- An estimate of supply during future droughts is also developed by adjusting the 2010 withdrawal data based on physical supplies available during historical droughts.
- Projections of future demand in nine water use categories are based on demographic and economic trends and population projections. Consistent methods and assumptions for each category of water use are applied across all planning regions.

Common Technical Approach

To prepare both the regional water plans and the state water plan, the State has developed a set of methods for assessing the available supply and projected demand that can be used consistently in all 16 planning regions in New Mexico. The objective of applying this common technical approach is to be able to efficiently develop a statewide overview of the balance between supply and demand in both normal and drought conditions, so that the State can move forward with planning and funding water projects and programs that will address the State's pressing water issues.

Public Involvement

The updated Handbook specifies that the RWP update process "shall be guided by participation of a representative group of stakeholders," referred to as the steering committee. Steering committee members provided direction for the public involvement process and relayed information about the planning effort to the water user groups they represent and other concerned or interested individuals.

In addition to the steering committee, the water planning effort included developing a master stakeholder list of organizations and individuals interested in the water planning update. This list was developed from the previous round of water planning and then expanded through efforts to identify representatives from water user groups and other stakeholders. Organizations and individuals on the master stakeholder list were sent announcements of meetings and the RWP update process and progress.

Over the two-year update process, eight meetings were held in the Jemez y Sangre region. These meetings identified the program objectives, presented draft supply and demand calculations for discussion and to guide strategy development, and provided an opportunity for stakeholders to provide input on the strategies that they would like to see implemented. All steering committee meetings were open to the public and interested stakeholders, and participation from all meeting attendees was encouraged.

Key Water Issues

The key water supply updates and issues currently impacting the Jemez y Sangre region include the following:

- Historically insufficient surface water supply, projected decreases in surface water supply, and earlier runoff due to climate change will add additional stresses to both agricultural water users and public water suppliers.

- San Juan-Chama Project water, once thought to have a "firm yield" of 96,200 acre-feet per year experienced shortages in 2014 and 2015, revealing the uncertainty of this surface water. Allocations in 2014 and 2015 were 88.9 and 92.8 percent of full allotments, respectively, due to a series of dry years.

- The Buckman Direct Diversion of San Juan-Chama Project water from the Rio Grande in 2011 helped expand the community of Santa Fe's conjunctive-use portfolio, but the system, which is vulnerable to contamination from Los Alamos and high sediment loads, has sustained some temporary operational difficulties. Los Alamos County, the City of Española, and Ohkay Owingeh are also exploring options for direct or indirect diversions of San Juan-Chama Project water.

- Groundwater resources are diminishing in some areas. An updated administrative groundwater model is needed to better manage the aquifers.

- The discharge of spring flow in the La Cienega area (which is the source of irrigation water) has declined over the past four decades due to groundwater pumping east of the springs. The long-term declining groundwater levels are a key indicator of human-caused groundwater depletions from wells upgradient in the Eldorado buried valley.

- Projected increases in water demand due to growing population and increased temperatures (which increase the consumptive irrigation requirement of crops and landscaping) are adding stress to the resources.

- Tension between urban and agricultural water use remains a key water supply issue in the region. Often, the only new source of water supply for urban uses is derived from transfers from agricultural water use (through direct diversion or for offsetting impacts of groundwater pumping), which may or may not be in the best interest of the community as a whole. Mechanisms to protect agriculture as part of the community while allowing some temporary water transfers to urban use need to be developed. Mechanisms could include contractual arrangements that allow a municipality to utilize agricultural water for offsets in particular years.

- Impacts following forest fires, including debris flows and high peak flows, loss of storage capacity in reservoirs, and water quality impacts, are addressed through forest restoration activities, which remain a high priority for this region. Forest restoration also needs to occur upstream in Colorado to protect the native flows in the Rio Grande and San Juan-Chama water, but this area is outside the jurisdiction of New Mexico.

- More intense precipitation events predicted with climate change require improving the landscape and its resiliency in sustaining peak flow events. Unfortunately, the recently released Federal Emergency Management Administration floodplain maps of Rio Arriba, Los Alamos, and Santa Fe counties do not consider predicted increases in extreme precipitation.

- The State of New Mexico, the United States, the City of Santa Fe, Santa Fe County, and the Pueblos of Nambe, Pojoaque, San Ildefonso, and Tesuque have entered into a settlement agreement that determines the water rights of the four pueblos in the Aamodt Adjudication. The settlement agreement specifies plans to supply pueblo and non-pueblo uses by bringing water to the Pojoaque Valley area through a regional water system that will be operated by Santa Fe County. An initial settlement agreement was signed in February 2006, and following the passage of the Aamodt Litigation Settlement Act on December 8, 2010 (Pub. L. No. 111-291, 124 Stat. 3064, 3134-3156), a final Settlement Agreement (conformed to include provisions of the Act) was signed by all parties, including the United States in its trust capacity, in March 2013.

- An environmental impact statement is currently being prepared for the implementation of the regional water system in the Pojoaque Valley. Rio Grande water for the regional system would be diverted at San Ildefonso Pueblo, through either a surface water intake or horizontal collector wells, and then treated.

- Hexavalent chromium has been detected in the regional aquifer in the Los Alamos area. The source is thought to be historical discharges from LANL cooling towers where potassium dichromate was used as a descaler. The Los Alamos County water supply is not presently impacted by the hexavalent chromium, but ongoing monitoring and remediation efforts will continue.

- In addition to the chromium, other constituents resulting from prior LANL activities are regularly monitored and reported. A summary of information regarding the monitoring is provided in LANL annual environmental reports.

- Many small rural drinking water systems within the region are challenged by the requirements for maintenance, upgrades, training, operation, and monitoring to ensure delivery of water that meets drinking water quality standards.

- In addition to the small drinking water systems in the region, there are many small acequia systems that also face challenges in obtaining financing for maintaining their infrastructure.

- The Rio Grande is the main river in the planning region and is fully appropriated. Much of the groundwater in the region is within the Rio Grande Underground Water Basin and is considered to be stream-connected; therefore, any new diversion of surface water or stream-connected groundwater requires the transfer of a valid water right (aside from small individual diversions from new domestic or livestock wells) and the transfer is limited to the consumptive use portion of that right. The availability of water rights may thus be a limiting factor in meeting the future water needs of the region.

- The Rio Grande Compact mandates delivery of specified amounts of water to Elephant Butte Reservoir, limiting the amount of water that can be diverted and consumed between the Otowi Gage in the Jemez y Sangre region and Elephant Butte Reservoir. Certain provisions of the Compact restrict storage in reservoirs constructed after 1929 when the Rio Grande Project water in Elephant Butte drops below certain levels.

- The congressionally authorized Middle Rio Grande Endangered Species Collaborative Program (MRGESCP) has allowed the coordination of efforts by federal, state, and local government, and Native American and private entities. The MRGESCP continues efforts to improve the status of the Rio Grande silvery minnow while assuring that other water uses are able to continue. At the same time, it continues to support the U.S. Bureau of Reclamation, Middle Rio Grande Conservancy District, and State of New Mexico in entering into an agreement (biological opinion) with the U.S. Fish and Wildlife Service for Rio Grande reservoir and river operations that include the effects of all the water uses described in this plan. If successful, Endangered Species Act compliance protections will remain in place for the region's Rio Grande Basin users.

Strategies to Meet Future Water Demand

An important focus of the RWP update process is to both identify strategies for meeting future water demand and support their implementation. To help address the implementation of new strategies, a review of the implementation of previous alternatives was first completed.

The 2003 *Jemez y Sangre Regional Water Plan* categorized the alternatives into five categories to help clarify which alternatives could be used to address the projected gap between supply and demand and which address the sustainability of the existing supplies. Alternatives in Categories I through III address actions that will potentially protect existing supplies for existing demands, including the environment, while those in Categories IV and V address the projected gap between supply and demand by either reducing the projected demand or increasing the supply. While some of the actions under Categories I through III may actually increase the amount of "wet water," they do not provide new water rights to close the gap between supply and demand.

To address the protection of existing supplies the 2003 RWP recommended the following strategies:

- Category I: Protect Existing Supplies and the Environment
    1. Watershed restoration and protection
    2. Enhanced recharge through stormwater management
    3. Pilot cloud seeding project
    4. Pursue sustainable management of water resources through better understanding of hydrogeology-improved regional model
    5. Establish critical management areas to manage domestic wells
    6. Develop conjunctive use strategies
    7. Appropriate flood flows (when Elephant Butte is spilling)
    8. Remove trace contaminants through local or regional water treatment systems
    9. Address septic tank water quality degradation
    10. Clean up contaminated groundwater and surface water through increased funding to the New Mexico Environment Department
    11. Continue funding programs to protect surface water and groundwater
    12. Support restoration of stream reaches to their designated uses
- Category II: Improve System Efficiency
    13. Wastewater reuse
    14. Encourage rainwater collection
    15. Line irrigation ditches
    16. Remove sediment in Santa Cruz Reservoir and investigate Nambe Reservoir
    17. Repair leaks in water systems
    18. Consider aquifer storage and recovery of excess water (treated effluent or flood flows)
    19. Pursue increased storage capacity in Abiquiu Reservoir
- Category III: Address Drought
    20. Develop drought contingency plans (develop triggers, analyze vulnerability, adopt mitigation measures)

To address the supply-demand gap, the 2003 RWP recommended the following strategies:

- Category IV: Reduce Projected Demand
  21. Pursue water conservation
  22. Pursue growth management
- Category V: Increase Water Supply
  23. Utilize San Juan-Chama Project water (Ohkay Owingeh, Los Alamos County, Española, City and County of Santa Fe)
  24. Transfer water rights through consensus process
  25. Limited use of domestic wells

The steering committee reviewed each of the 2003 RWP strategies and indicated that they are all still relevant except for cloud seeding, though some are being refocused as new recommended strategies. The degree to which each of the strategies under Categories IV and V were implemented to reduce the supply-demand gap was evaluated for each of the subregions.

During the two-year update process the Jemez y Sangre steering committee and stakeholders identified projects, programs, and policies (PPPs) to address their water issues. Some water projects were already identified through the State of New Mexico Infrastructure Capital Improvement Plan, Water Trust Board, Capital Outlay, and New Mexico Environment Department funding processes; these projects are also included in a comprehensive table of PPP needs. The information was not ranked or prioritized; it is a table of all of the PPPs that regional stakeholders are currently interested in pursuing. In the Jemez y Sangre region, projects identified on the PPP table are primarily water system infrastructure, irrigation system upgrades, and watershed restoration projects.

At steering committee meetings held in 2015 and 2016, the group discussed projects that would have a larger regional or subregional impact and for which there is interest in collaboration to seek funding and for implementation. The following key collaborative projects were identified by the steering committee and Jemez y Sangre region stakeholders:

- Rio Grande Water Fund, watershed restoration
- Mapping regional climate resiliency
- Española Basin groundwater model
- Regional water supply monitoring
- Protect local agriculture
- Consolidate mutual domestic resources as appropriate

- Santa Fe Basin regional water authority evaluation
- Planning for resilience and restoration in the greater Santa Fe fireshed
- Prepare the region to be more resilient under climate change

The 2016 Jemez y Sangre RWP characterizes supply and demand issues and identifies strategies to meet the projected gaps between water supply and demand. This plan should be added to, updated, and revised to reflect implementation of strategies, address changing conditions, and continue to inform water managers and other stakeholders of important water issues affecting the region.

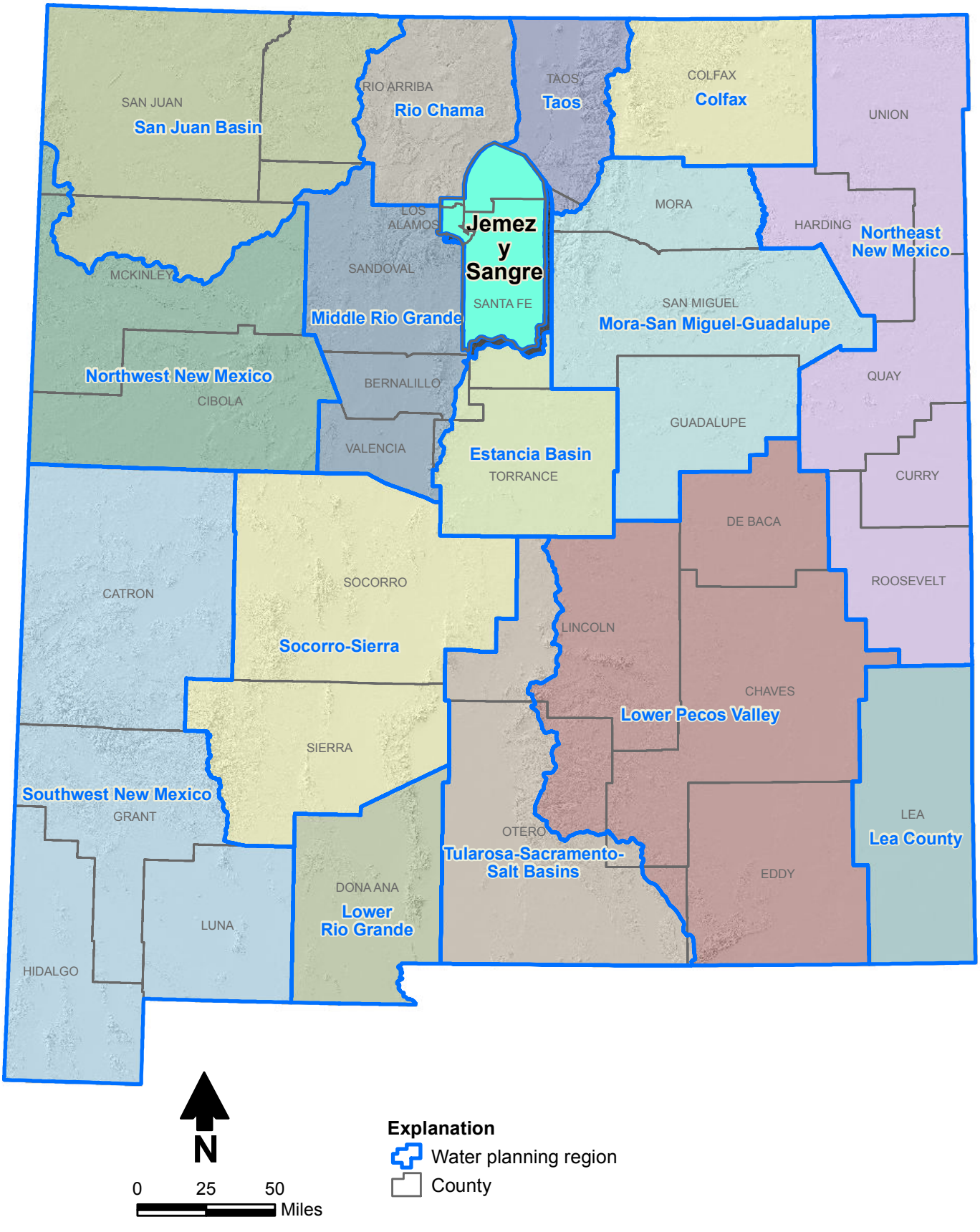
1. Introduction

The Jemez y Sangre Water Planning Region, which includes primarily the northern two-thirds of Santa Fe County, all of Los Alamos County, and the southeastern part of Rio Arriba County (Figure 1-1), is one of 16 water planning regions in the State of New Mexico. Regional water planning was initiated in New Mexico in 1987, its primary purpose being to protect New Mexico water resources and to ensure that each region is prepared to meet future water demands. Between 1987 and 2008, each of the 16 planning regions, with funding and oversight from the New Mexico Interstate Stream Commission (NMISC), developed a plan to meet regional water needs over the ensuing 40 years. The *Jemez y Sangre Regional Water Plan* was completed in March 2003 (DBS&A and Lewis, 2003) and accepted by NMISC on April 23, 2003. Two subsequent updates to the regional water plan (RWP), in 2007 and 2009, were prepared by the Jemez y Sangre Water Planning Council (JySWPC) to address selected issues for which updated information was available (JySWPC, 2007; DBS&A and Lewis, 2009).

The purpose of this document is to provide new and changed information related to water planning in the Jemez y Sangre region, as listed in the bullets below, and to evaluate projections of future water supply and demand for the region using a common technical approach applied to all 16 planning regions state-wide.. Accordingly, the following sections summarize key information in the accepted and updated plans and provide updated information regarding changed conditions and additional data that have become available. Specifically, this update:

- Identifies significant new research or data that provide a better understanding of current water supplies and demands in the Jemez y Sangre region.
- Presents recent water use information and develops updated projections of future water demand using the common technical approach developed by the NMISC, in order to facilitate incorporation into the New Mexico State Water Plan.
- Identifies strategies, including infrastructure projects, conservation programs, watershed management policies, or other types of strategies that will help to balance supplies and projected demands and address the Jemez y Sangre region's future water management needs and goals.
- Discusses other goals or priorities as identified by stakeholders in the region.

The water supply and demand information in this regional water plan (RWP) is based on current published studies and data and information supplied by water stakeholders in the region. Tribes and pueblos in New Mexico are not required to provide water use data to the State, and so tribal water use data are not necessarily reflected in this RWP update.



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JEMEZ Y SANGRE REGIONAL WATER PLAN 2016

Location of Jemez y Sangre Water Planning Region

Figure 1-1

The organization of this update follows the template provided in the *Updated Regional Water Planning Handbook: Guidelines to Preparing Updates to New Mexico Regional Water Plans* (NMISC, 2013) (referred to herein as the Handbook):

- Information regarding the public involvement process followed during development of this RWP update and entities involved in the planning process is provided in Section 2.
- Section 3 provides background information regarding the characteristics of the Jemez y Sangre planning region, including an overview of updated population and economic data.
- The legal framework and constraints that affect the availability of water are briefly summarized in Section 4, with recent developments and any new issues discussed in more detail.
- The physical availability of surface water and groundwater and water quality constraints was discussed in detail in the 2003 RWP and 2007/2009 updates; key information from those documents is summarized in Section 5, with new information that has become available since 2009 incorporated as applicable. In addition, Section 5 presents updated monitoring data for temperature, precipitation, drought indices, streamflow, groundwater levels, and water quality, and an estimate of the administrative water supply including an estimate of drought supply.

Common Technical Approach

To prepare both the regional water plans and the state water plan, the state has developed a set of methods for assessing the available supply and projected demand that can be used consistently in all 16 planning regions in New Mexico. This common technical approach outlines the basis for defining the available water supply and specifies methods for estimating future demand in all categories of water use:

- The method to estimate the available supply (referred to as the *administrative water supply* in the Handbook) is based on withdrawals of water as reported in the *NMOSE Water Use by Categories 2010* report,* which provide a measure of supply that considers both physical supply and legal restrictions (i.e., the diversion is physically available, for withdrawal, and its use is in compliance with water rights policies) and thus reflects the amount of water available for use by a region. An estimate of supply during future droughts is also developed by adjusting the 2010 withdrawal data based on physical supplies available during historical droughts.
- Projections of future demands in nine categories of water use are based on demographic and economic trends and population projections. Consistent methods and assumptions for each category of water use are applied across all planning regions.

The objective of applying this common technical approach is to be able to efficiently develop a statewide overview of the balance between supply and demand in both normal and drought conditions, so that the state can move forward with planning and funding water projects and programs that will address the state's pressing water issues.

* *Tribes and Pueblos in New Mexico are not required to provide water use data to the State. Therefore, tribal water use data are not necessarily reflected in this plan.*

- The information regarding historical water demand in the planning region, projected population and economic growth, and projected future water demand was discussed in detail in the 2003 RWP and 2007/2009 updates. Section 6 provides updated population and water use data, which are then used to develop updated projections of future water demand.

- Based on the current water supply and demand information discussed in Sections 5 and 6, Section 7 updates the projected gap between supply and demand of the planning region.

- Section 8 outlines new strategies (water programs, projects, or policies) identified by the region as part of this update, including additional water conservation measures.

Water supply and demand information (Sections 5 through 7) is assessed in accordance with a common technical approach, as identified in the Handbook (NMISC, 2013) (where it is referred to as a common technical *platform*). This common technical approach is a simple methodology that can be used consistently across all regions to assess supply and demand, with the objective of efficiently developing a statewide overview of the balance between supply and demand for planning purposes.

Four terms frequently used when discussing water throughout this plan have specific definitions related to this RWP:

- *Water use* is water withdrawn from a surface or groundwater source for a specific use. In New Mexico water is accounted for as one of the nine categories of use in the *New Mexico Water Use by Categories 2010* report prepared by the New Mexico Office of the State Engineer (NMOSE).

- *Water withdrawal* is water diverted or removed from a surface or groundwater source for use.

- *Administrative water supply* is based on the amount of water withdrawals in 2010 as outlined in the *New Mexico Water Use by Categories 2010* report.

- *Water demand* is the amount of water needed at a specified time.

2. Public Involvement in the Planning Process

During the past two years, the regional water planning steering committees, interested stakeholders, NMISC, and consultants to the NMISC have worked together to develop regional water plan updates. The purpose of this section is to describe public involvement activities during the regional water plan update process, guided by the Handbook, which outlined a public involvement process that allowed for broad general public participation combined with leadership from key water user groups.

2.1 The New Mexico Interstate Stream Commission's Role in Public Involvement in the Regional Water Plan Update Process

The NMISC participated in the public involvement process through a team of contractors and NMISC staff that assisted the regions in conducting public outreach. The NMISC's role in this process consisted of certain key elements:

- Setting up and facilitating meetings to carry out the regional water plan update process.
- Working with local representatives to encourage broad public involvement and participation in the planning process.
- Working to re-establish steering committees in regions that no longer had active steering committees.
- Supporting the steering committees once they were established.
- Facilitating input from the stakeholders and steering committees in the form of compiling comments to the technical sections drafted by the State and developing draft lists of projects, programs, and policies (PPPs) based on meeting input, with an emphasis on projects that could be implemented.
- Finalizing Section 8, Implementation of Strategies to Meet Future Water Demand, by writing a narrative that describes the key collaborative strategies based on steering committee direction.

This approach represents a change in the State's role from the initial round of regional water planning, beginning in the 1990s through 2008, when the original regional water plans were developed. During that phase of planning, the NMISC granted regions funding to form their own regional steering committees and hire consultants to write the regional water plans, but NMISC staff were not directly involved in the process. Over time, many of the regional steering committees established for the purpose of developing a region's water plan disbanded. Funding for regional planning decreased significantly, and regions were not meeting to keep their plans current.

In accordance with the updated Handbook (NMISC, 2013), the NMISC re-established the regional planning effort in 2014 by working with existing local and regional stakeholders and organizations, such as regional councils of government, water providers, water user organizations, and elected officials. The NMISC initiated the process by hosting and facilitating meetings in all 16 regions between February and August of 2014. During these first months, through its team of consultants and working with contacts in the regions, the NMISC prepared "master stakeholder" lists, comprised of water providers and managers, local government representatives, and members of the public with a general interest in water, and assisted in

developing updated steering committees based on criteria from the Handbook and recommendations from the stakeholders. (The steering committee and master stakeholder lists for the Jemez y Sangre region are provided in Section 2.2.1 and Appendix 2-A, respectively.) These individuals were identified through research, communication with other water user group representatives in the region, contacting local organizations and entities, and making phone calls. Steering committee members represent the different water users groups identified in the Handbook and have water management expertise and responsibilities.

The steering committee was tasked with four main responsibilities:

- Provide input to the water user groups they represent and ensure that other concerned or interested individuals receive information about the water planning process and meetings.
- Provide direction on the public involvement process, including setting meeting times and locations and promoting outreach.
- Identify water-related PPPs needed to address water management challenges in the region and future water needs.
- Comment on the draft *Jemez y Sangre Regional Water Plan 2016*, as well as gather public comments. (Appendix 2-B includes a summary of comments on the technical and legal sections of the document that were prepared by the NMISC [Sections 1, 3, 4, 5, 6, and 7] and comments received from the public on Section 8.)

In 2016, the NMISC continued to support regional steering committees by facilitating three additional steering committee meetings open to the public in each of the 16 regions. The purpose of these meetings was to provide the regions with their draft technical sections that the NMISC had developed and for the regions to further refine their strategies for meeting future water challenges.

Throughout the regional water planning process all meetings were open to the public. Members of the public who have an interest in water were invited directly or indirectly through a steering committee representative to participate in the regional water planning process.

Section 2.2 provides additional detail regarding the public involvement process for the Jemez y Sangre 2016 regional water plan.

2.2 Public Involvement in the Jemez y Sangre Planning Process

This section documents the steering committee and public involvement process used in updating the plan and documenting ideas generated by the region for future public involvement in the implementation of the plan.

2.2.1 Identification of Regional Steering Committee Members

The Handbook (NMISC, 2013) specifies that the steering committee membership include representatives from multiple water user groups. Some of the categories may not be applicable to a specific region, and the regions could add other categories as appropriate to their specific region. The steering committee representation listed in the Handbook includes:

- Agricultural – surface water user
- Agricultural – groundwater user
- Municipal government
- Rural water provider
- Extractive industry
- Environmental interest
- County government
- Local (retail) business
- Tribal entity
- Watershed interest
- Federal agency
- Other groups as identified by the steering committee

Steering committee members were recruited initially from the previous planning effort and outreach by the consultants to specific municipalities in the four-county Jemez y Sangre region and to key decision-makers. Other steering committee members were identified and asked to participate through interviews, public meetings, recommendations, and outreach to specific interests. Through this outreach, the Jemez y Sangre region established a representative steering committee, the members of which are listed in Table 2-1. Tribal governments were invited to attend in whatever capacity was appropriate to them.

The steering committee includes several state and federal agency representatives who participate as technical resources to the region. These individuals are generally knowledgeable about water issues in the region and are involved with many of the PPPs related to water management in the region. The list also includes non-profit groups who are involved in local water-related initiatives and/or have expertise such as watershed restoration or mutual domestic concerns and issues. The steering committee identified four co-chairs: Kathy Holian, Commissioner of the Santa Fe County Board of County Commissioners; Peter Ives, Councilor, City of Santa Fe; Peggy Sue Martinez, Councilor, City of Española; and Brian Bosshardt, Los Alamos County Assistant Administrator. These leaders were chosen because of their knowledge about the three-county area and have been helpful to maintain an active steering committee. The co-chairs were supported by alternates (staff) that attended and participated in meetings if chairs were unable to attend.

Table 2-1. Steering Committee Members, Jemez y Sangre Water Planning Region

Page 1 of 2

Water User Group	Name	Organization / Representation
Agricultural – groundwater user	Paul White	SF Basin Water Users Association
Agricultural – surface water user	William Mee	Agua Fria Acequia Association
County government	Kathy Holian, Co-Chair	Commissioner, Santa Fe County
	Claudia Borchert	Director, Santa Fe County Utilities
	Jerry Schoeppner	Hydrologist, Santa Fe County Utilities
	Hvtce Miller	Tribal Liaison, Santa Fe County
	Brian Brossard	Assistant Administrator, Los Alamos County
	James Alarid	Deputy Utility Manager, Los Alamos County
	Lucia Sanchez	Rio Arriba Director of Planning and Zoning
Municipal government	Peter Ives, Co-Chair	Councilor, City of Santa Fe
	Andrew Erdmann (alternate)	City of Santa Fe Water Division
	Peggy Sue Martinez, Co-Chair	Councilor, City of Espanola
	Steven Trujillo (alternate)	Water Supervisor, Espanola Public Works
Rural water provider	Jim Jenkins, President	El Dorado Water District
	David Chakroff	General Manager, El Dorado Water District
	Martha Graham	NM Rural Water Association, Source Water
Extractive industry		
Environmental interests	Toner Mitchell	Trout Unlimited
	Paul Paryski	Sierra Club
	John Buchser (alternate)	Sierra Club
	Laura McCarthy	The Nature Conservancy
Local business		
Tribal	Ryan Swazo-Hinds	Tesuque Pueblo
	Charlie Dorame	Tesuque Pueblo
	Leroy Alvarado	Water and Wastewater Systems, Pojoaque Pueblo
	Philip Perez, Governor	Nambe Pueblo (Invited)
	Larry Phillips	Director, Natural Resources, Ohkay Owingeh Pueblo (Invited)
	Ray Martinez	Environment Department, San Ildefonso Pueblo (Invited)

Table 2-1. Steering Committee Members, Jemez y Sangre Water Planning Region

Page 2 of 2

Water User Group	Name	Organization / Representation
Watershed Interest	Andy Otto	Executive Director, Santa Fe Watershed Association
	Alfredo Montoya	Chairman of the Upper Rio Grande Watershed District
Federal agency (technical support to the region)	Thomas Gonzales	USDA-NRCS
	Sanford “Sandy” Hurlocker	District Ranger, Espanola Ranger District, SF National. Forest
	Michelle T. Estrada-Lopez, Pecos Basin	U.S. Bureau of Reclamation
State agency (technical support to the region)	Eric Gahate	North Central Economic Development District
	Greg Kaufman	NMED- Surface Water Quality Bureau
	Danielle Shuryn	NMED, Source Water
	Jason Lithgow	State Land Office
	Todd Haines	NM State Forestry
	Shann Stringer	Santa Fe-Pojoaque Soil and Water Conservation District
Other groups as identified by the steering committee	Charlie Nylander	Española Basin Technical Advisory Group
	Charles Vokes	Buckman Direct Diversion Project
	Conci Bokum	Interested Stakeholder

2.2.2 Regional Water Plan Update Meetings

All steering committee meetings and NMISC-facilitated water planning meetings were open to the public and interested stakeholders. Meetings were announced to the master stakeholder list by e-mail, and participation from all meeting attendees was encouraged. Steering committee members served as a conduit of information to others and, through their own organizational communications with other agencies, encouraged participation in the process, and steering committee members were asked to share information about the process with other stakeholders in the region. Generally, steering committee members ensured that other concerned or interested individuals received the announcements and recommended key contacts to add to the master stakeholder list throughout the planning process.

The steering committee discussed and made the following recommendations regarding meeting times and locations that would maximize public involvement:

- Meetings should be rotated as possible, with Santa Fe as the central point for the region.
- Community, county or city facilities were used.
- Weekdays during the day were the best meeting times.

Over the two-year update process, eight meetings were held in the Jemez y Sangre region. A summary of each of the meetings is provided in Table 2-2.

2.2.3 Current and Future Ideas for Public Outreach during Implementation of the Regional Water Plan Update

The steering committee identified the following process for additional public outreach:

- The local governments will continue to post information about RWP activities on their websites. The group also suggested regular updates to websites of the various governing bodies.
- Outreach to pueblos continues and their participation will be decided by their own governing bodies as appropriate.
- Meetings will continue to be held in the three- county region. The master list will be maintained by Santa Fe County.
- The RWP effort will be chaired by the four co-chairs.
- The group suggested that it would helpful to have subcommittees such as a Watershed Subcommittee, Public Involvement Subcommittee, and a Water Conservation Subcommittee.

Table 2-2. Jemez y Sangre Region Public Meetings

Date	Location	Purpose	Meeting Summary
FY 2014			
04/04/2014	Pojoaque Pueblo	Kickoff meeting: Present the regional water planning update process to the region; discuss roles of the region and continue to conduct outreach to begin building the steering committee.	Representatives from many of the water user groups attended the meeting and were instrumental in identifying other individuals as potential representatives for a particular group. Many of the meeting attendees were not on the master stakeholder list, and those individuals were added to the list.
FY 2015			
11/13/2014	Chavez Community Center, Santa Fe, NM	Present the technical data compiled and synthesized for the region.	Data presented included population and economic trends through a series of tables, the administrative water supply, the projected future water demand, and the gap between supply and demand for both normal and drought years. In addition, the presentation reaffirmed the development of a steering committee to guide the process as outlined in the Handbook.
4/16/2015	Santa Fe Community Convention Center, Santa Fe, NM	Review the update process, development of the steering committee, and development of specific subcommittees.	The group discussed new information from the region and/or the projects, policies, programs (PPPs) that had been implemented since the 2005 plan. The steering committee membership and leadership were affirmed, with alternates named as appropriate. The group further discussed where future meetings would be held and the time that worked the best for getting the most attendance.

Table 2-2. Jemez y Sangre Region Public Meetings
Page 2 of 3

Date	Location	Purpose	Meeting Summary
6/8/2015	Genoveva Chavez Center, Santa Fe, NM	Discuss elements that would be included in the public involvement chapter and ideas for FY 2015-2016 outreach. Review and discuss future project checklist discussed at previous meeting and sent to stakeholders. Develop a public involvement plan for future implementation.	The future project checklist was reviewed and discussed, and a deadline for sending information to the consultants was confirmed. The group participated in a brainstorming activity that helped to identify regional projects that held the potential for the greatest collaboration and effort, ranking the level of interest, although it was noted that there is no official ranking of projects for funding priority as part of the regional water planning update process.
FY 2016			
2/05/2016	Genoveva Chavez Center, Santa Fe, NM	Review steering committee membership and leadership. Focus on the PPPs to be included in the update.	The group reviewed the steering committee membership and suggested additional members to fill vacancies and affirmed that steering committee leadership would continue to be the four co-chairs (Kathy Holian, Peter Ives, Peggy Sue Martinez and James Alarid). The group participated in an activity that helped to refine regional projects that held the potential for the greatest collaboration and effort.
3/22/2016	North Central Regional Transit District Board Room, Española, NM	Refine the key collaborative PPP recommendations specific to Section 8.	The group identified a number of projects that would potentially have greater interest and benefit multiple stakeholders and added information in a small group format using worksheets.
5/23/2016	Nancy Rodriguez Community Center, Santa Fe, NM	Discuss comments and revisions to the Executive Summary, Public Involvement, and Strategies sections and review the process for finalizing the RWP update.	The group reviewed Sections 2 and 8 and the PPP list. Corrections were made to the documents. Chairs were identified to present the plan to the NMISC and the group made plans for meeting in July to begin to discuss ideas for implementation. Comments were reviewed and the comment process described. Next steps for implementation were developed.

Table 2-2. Jemez y Sangre Region Public Meetings
Page 3 of 3

Date	Location	Purpose	Meeting Summary
6/15/2016	Los Alamos Municipal Building, Los Alamos, NM	Refine and reach consensus on Section 8 key collaborative strategies and Section 2 (Public Involvement).	The group reviewed Sections 2 and 8 and added information that further clarified key partners, funding, and other ideas. Section 2 was reviewed without changes. The group further affirmed the two presenters to the NMISC

- Surveys may be used with certain user groups such as mutual water users associations to gather information.
- The steering committee may create a newsletter that would be posted on the various municipal websites, as well as printed in various media and distributed to interested participants by email.
- The YouTube video *Sustainable Water for the Española Basin*, produced by the Española Basin Regional Issues Forum (EBRIF) can be used for educational purposes.
- Steering committee members may arrange to make presentations at meetings and activities sponsored by others. These could include Chamber of Commerce meetings, environmental organization meetings, county fairs and school events, among others.
- The Jemez y Sangre steering committee may explore one or more joint meetings with the Middle Rio Grande (Region 12), Taos (Region 7), and Rio Chama (Region 14) regional water planning steering committees, with the goal to exchange elements of RWPs that are relevant to neighboring regions, promote collaboration, and identify and promote planning alternatives that would benefit these adjacent regions.

3. Description of the Planning Region

This section provides a general overview of the Jemez y Sangre Water Planning Region. Detailed information, including maps illustrating the land use and general features of the region, was provided in the 2003 RWP; that information is briefly summarized and updated as appropriate here. Additional detail on the climate, water resources, and demographics of the region is provided in Sections 5 and 6.

3.1 General Description of the Planning Region

The Jemez y Sangre Water Planning Region is located in north-central New Mexico. The region includes the northern two-thirds of Santa Fe County, all of Los Alamos County, and a small part of southern Rio Arriba County. Two small portions of Sandoval County are also within the planning region boundaries, but have virtually no impact on the regional demographics. The region encompasses the drainage area of the Rio Grande from Embudo to south of Galisteo and between the Sangre de Cristo Mountains on the east and the Jemez Mountains near Los Alamos (Figure 1-1). The northern, southern, and eastern boundaries of the region correspond to the boundaries of other water planning regions (Chama, Taos, Mora-San Miguel-Guadalupe, Estancia). The southern two-thirds of the western boundary coincides with the Middle Rio Grande planning region. The region is bounded on the north by Rio Arriba and Taos counties, on the west by Sandoval County, on the south by southern Santa Fe County, and on the east by San Miguel, Mora, and Taos counties (Figure 1-1).

There are eight pueblos in the region:

- Cochiti
- Nambe
- Ohkay Owingeh
- Pojoaque
- San Ildefonso
- Santa Clara
- Santo Domingo
- Tesuque

The total area of the planning region is approximately 2,110 square miles, distributed among the four counties as follows

- Rio Arriba: 501 square miles
- Los Alamos: 109 square miles
- Santa Fe: 1,475 square miles
- Sandoval: 25 square miles

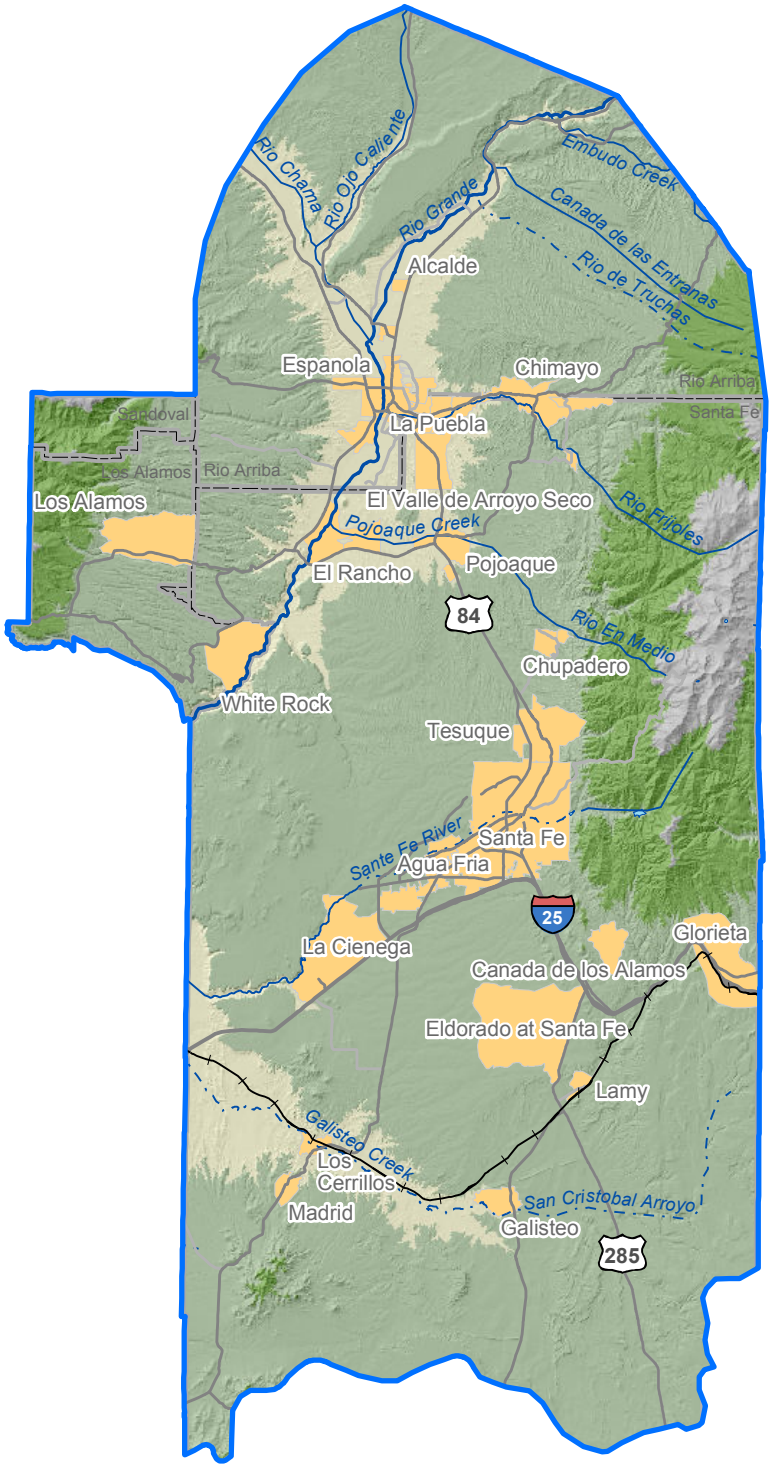
3.2 Climate

Climate in the Jemez y Sangre planning region varies from semiarid to alpine, depending primarily on elevation. Mean annual temperatures in the planning region are around 50 degrees Fahrenheit (°F). Average annual precipitation ranges from more than 40 inches in the mountain ranges to 10 to 12 inches in the lowest elevations. Annual precipitation is extremely variable, fluctuating over a range of about 50 percent above and below the long-term average. More detail about regional climate and its influence on water supply is provided in Section 5.1.

3.3 Major Surface Water and Groundwater Sources

The Rio Grande, which drains south through the region from Embudo to Cochiti Reservoir, is the major surface water feature (Figure 3-1), although use of this water is limited by provisions of the Rio Grande Compact. The provisions of the Rio Grande Compact effectively split the available surface water supply for the Rio Grande Basin above Elephant Butte Reservoir into the part north of the Otowi gage and the part south of the gage (see Section 5 for discussion of the Rio Grande Compact). The Rio Chama, which flows into the Rio Grande near the northwest boundary of the planning region, also contributes a significant amount of water to the region, much of it imported water from the San Juan-Chama Project. The Santa Fe River, which supplies a portion of the City of Santa Fe water supply, Galisteo Creek south of Santa Fe, and the Rio Nambe, Rio Tesuque and Pojoaque River north of Santa Fe are also important tributaries in the region. The quality of the surface water in the region is generally very good to excellent.

The Tertiary-age Santa Fe Group is the primary aquifer in most of the planning region; the Galisteo Formation is the main water-bearing unit in the southern part of the region.



N

0 5 10 Miles

Explanation

- Stream (dashed where intermittent)
- Lake
- City
- County
- Water planning region

Elevation (ft msl)

- 4,000 - 6,000
- 6,000 - 8,000
- 8,000 - 10,000
- >10,000

JEMEZ Y SANGRE
REGIONAL WATER PLAN 2016

Regional Map

Figure 3-1

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Groundwater is the source of at least part of the public water supply for all of the communities in the Jemez y Sangre region.

The Jemez y Sangre region overlies the Rio Grande NMOSE-declared underground water basins (UWBs) (Northern and Middle) and a small part of the Upper Pecos UWB. (A declared UWB is an area of the state proclaimed by the State Engineer to be underlain by a groundwater source having reasonably ascertainable boundaries. By such proclamation the State Engineer assumes jurisdiction over the appropriation and use of groundwater from the source.) These UWBs are shared with the following water planning regions:

- Taos (Rio Grande [Northern])
- Rio Chama (Rio Grande [Northern])
- Middle Rio Grande (Rio Grande [Middle])

A very small portion of the Upper Pecos UWB (shared with the Mora-San Miguel-Guadalupe water planning region) also extends into the Jemez y Sangre region, but groundwater diversions in that area are minimal. A map showing all of these basins is provided in Section 4.1.2.2.

Additional information on administrative basins and surface and groundwater resources of the region is included in Section 4 and Sections 5.2 and 5.3, respectively.

3.4 Demographics, Economic Overview, and Land Use

The Jemez y Sangre Region includes the entirety of Los Alamos County and most of the population of Rio Arriba and Santa Fe counties. (A majority of the physical area of Rio Arriba County is included within the Rio Chama region.) In 2010, the populations of the counties within this planning region were 134,156 in Santa Fe County, 29,558 in Rio Arriba County, and 17,950 in Los Alamos County. The 2013 populations of the three counties were 147,423 in Santa Fe County, 40,072 in Rio Arriba County, and 17,798 in Los Alamos County (U.S. Census Bureau, 2014a).

As shown in Table 3-1, Santa Fe County grew from 129,292 persons in 2000 to 144,170 in 2010, while Rio Arriba and Los Alamos each experienced declines in population. This trend has continued through 2013, with the population of Santa Fe County increasing to 147,423 and Rio Arriba and Los Alamos counties experiencing small declines. The economy of the region has traditionally been driven by tourism and government employment, including Los Alamos National Laboratory (LANL). The largest employment categories in the region are education/healthcare, professional and scientific services, retail trade, tourism-related services (arts, entertainment, recreation, hospitality, and food services), and public administration. Agriculture is the largest water use, followed by public water supply and domestic uses.

Land in the Jemez y Sangre water planning region is owned by various federal, tribal, state, and private entities, as illustrated on Figure 3-2and outlined below:

Table 3-1. Summary of Demographic and Economic Statistics for the Jemez y Sangre Water Planning Region

a. Population

County	2000 Total	2010		2013
		Total	Within Region [a]	
Rio Arriba	41,190	40,246	29,558	40,072
Los Alamos	18,343	17,950	17,950	17,798
Santa Fe	129,292	144,170	134,156	147,423
Total Region	188,825	202,366	181,664	205,293

Source: U.S. Census Bureau, 2014a, unless otherwise noted.
[a] U.S. Census Bureau, 2010

b. Income and Employment

County	2008-2012 Income [a]		Labor Force Annual Average 2013 [b]		
	Per Capita ($)	Percentage of State Average	Number of Workers	Number Employed	Unemployment Rate (%)
Rio Arriba	20,253	85	18,615	16,979	8.3
Los Alamos	50,740	214	9,224	8,857	4.0
Santa Fe	32,530	137	74,536	70,472	5.5
Total Region	—	—	102,375	96,308	5.9

[a] U.S. Census Bureau, 2014c, American Community Survey 5-Year Estimate
[b] NM Department of Workforce Solutions, 2014

Table 3-1. Summary of Demographic and Economic Statistics for the Jemez y Sangre Water Planning Region

c. Business Environment

County	Industry	Number Employed	Number of Businesses
	2008-2012 [a]		*2012* [b]
Rio Arriba	Education/Healthcare	3,735	574
	Professional, scientific and management	2,377	
	Entertainment, recreation, arts, hospitality, restaurant	2,257	
	Public Administration	2,214	
Los Alamos	Professional, scientific, etc.	4,907	379
	Education/Healthcare	1,558	
	Retail trade	516	
	Entertainment, recreation, arts, hospitality, restaurant	446	
Santa Fe	Education/Healthcare	6,828	4,702
	Retail trade	3,866	
	Construction	3,127	
	Public Administration	2,910	
	Entertainment, recreation, arts, hospitality, restaurant	2,574	

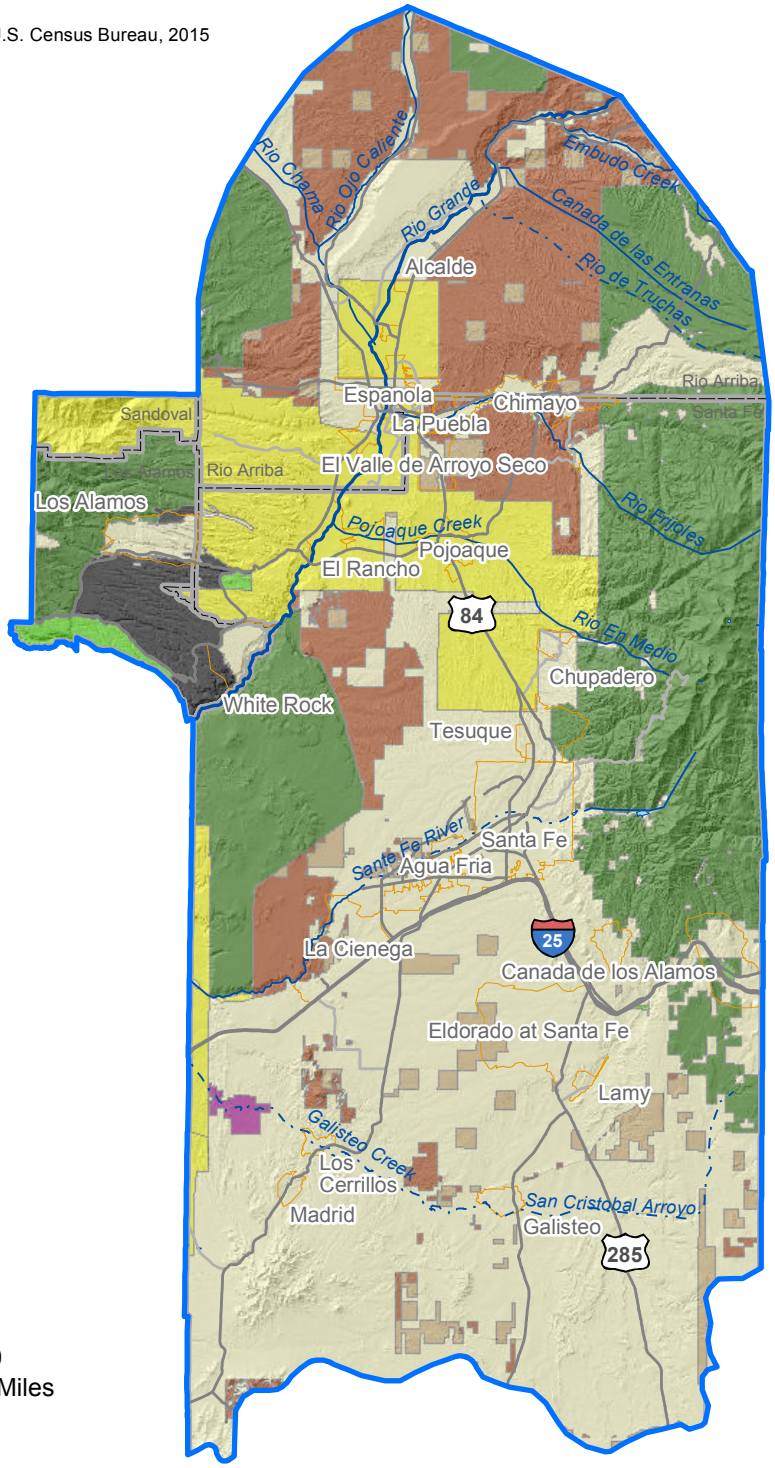
[a] U.S. Census Bureau, 2014b

d. Agriculture

County	Farms / Ranches [a]			Most Valuable Agricultural Commodities [b]
	Number	Acreage		
		Total	Average	
Rio Arriba	1,892	1,432,897	757	Cattle, calves, Other crops and hay Fruit, tree nuts, and berries Vegetables and melons
Los Alamos	9	17	2	NA
Santa Fe	715	717,704	1,004	Cattle and calves Other crops and hay
Total Region	2,616	2,150,618	822	NA

[a] USDA NASS, 2014, Table 1 NA = Information not available
[b] USDA NASS, 2014, Table 2

Source: BLM, 2016 and U.S. Census Bureau, 2015



N

0 5 10 Miles

Explanation

- Stream (dashed where intermittent)
- Lake
- City
- County
- Water planning region
- Land grant

Land surface ownership

- Bureau of Land Management
- Department of Defense
- Department of Energy
- National Forest Service
- Tribal
- NPS
- Other federal agency
- Private
- State
- State Park

JEMEZ Y SANGRE
REGIONAL WATER PLAN 2016

Land Ownership

Figure 3-2

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- Federal agencies: 870 square miles
- Tribes: 258 square miles
- State agencies: 73 square miles
- Private entities: 909 square miles

Current statistics on the economy and land use in each county, compiled from the U.S. Census Bureau and the New Mexico Department of Workforce Solutions, are summarized in Table 3-1. Additional detail on demographics and economics within the region is provided in Section 6.

4. Legal Issues

4.1 Relevant Water Law

4.1.1 State of New Mexico Law

The 2003 plan, Appendix D, includes a very comprehensive discussion of water law applicable to the region. However, since the accepted regional water plan for the Jemez y Sangre Water Planning Region was published in 2003, and subsequently updated in 2007 and 2009, there have been significant changes in New Mexico water law through case law, statutes, and regulations. These changes address statewide issues including, but not limited to, domestic well permitting, the State Engineer's authority to regulate water rights, administrative and legal review of water rights matters, use of settlements to allocate water resources, the rights appurtenant to a water right, and acequia water rights. New law has also been enacted to address water project financing and establish a new strategic water reserve. These general state law changes are addressed by topic area below. State law more specific to the Jemez y Sangre region is discussed in Section 4.1.2.

4.1.1.1 Regulatory Powers of the NMOSE

In 2003, the New Mexico Legislature enacted NMSA 1978, Section 72-2-9.1, relating to the administration of water rights by priority date. The legislature recognized that "the adjudication process is slow, the need for water administration is urgent, compliance with interstate compacts is imperative and the state engineer has authority to administer water allocations in accordance with the water right priorities recorded with or declared or otherwise available to the state engineer." Section 72-2-9.1(A). The statute authorized the State Engineer to adopt rules for priority administration in a manner that does not interfere with future or pending adjudications, creates no impairment of water rights other than what is required to enforce priorities, and creates no increased depletions.

Based on Section 72-2-9.1, the State Engineer promulgated the Active Water Resource Management (AWRM) regulations in December 2004. The regulation's stated purpose is to

establish the framework for the State Engineer "to carry out his responsibility to supervise the physical distribution of water to protect senior water right owners, to assure compliance with interstate stream compacts and to prevent waste by administration of water rights." 19.25.13.6 NMAC. In order to carry out this purpose, the AWRM regulations provide the framework for the promulgation of specific water master district rules and regulations. No district-specific AWRM regulations have been promulgated in the Jemez y Sangre region at the time of writing.

The general AWRM regulations set forth the duties of a water master to administer water rights in the specific district under the water master's control. Before the water master can take steps to manage the district, AWRM requires the NMOSE to determine the "administrable water rights" for purposes of priority administration. The State Engineer determines the elements, including priority date, of each user's administrable water right using a hierarchy of the best available evidence, in the following order: (A) a final decree or partial final decree from an adjudication, (B) a subfile order from an adjudication, (C) an offer of judgment from an adjudication, (D) a hydrographic survey, (E) a license issued by the State Engineer, (F) a permit issued by the State Engineer along with proof of beneficial use, and (G) a determination by the State Engineer using "the best available evidence" of historical, beneficial use. Once determined, this list of administrable water rights is published and subject to appeal, 19.25.13.27 NMAC, and once the list is finalized, the water master may evaluate the available water supply in the district and manage that supply according to users' priority dates.

The general AWRM regulations also allow for the use of replacement plans to offset the depletions caused by out-of-priority water use. The development, review, and approval of replacement plans will be based on a generalized hydrologic analysis developed by the State Engineer.

The general AWRM regulations were unsuccessfully challenged in court in *Tri-State Generation and Transmission Ass'n, Inc. v. D'Antonio,* 2012-NMSC-039. In this case, the New Mexico Supreme Court analyzed whether Section 72–2–9.1 provided the State Engineer with the authority to adopt regulations allowing it to administer water rights according to interim priority determinations developed by the NMOSE.

In *Tri-State* the Court held that (1) the Legislature delegated lawful authority to the State Engineer to promulgate the AWRM regulations, and (2) the regulations are not unconstitutional on separation of powers, due process, or vagueness grounds. Specifically, the Court found that establishing such regulations does not violate the constitutional separation of powers because AWRM regulations do not go beyond the broad powers vested in the State Engineer, including the authority vested by Section 72–2–9.1. The Court further found that the AWRM regulations did not violate the separation of powers between the executive and the judiciary despite the fact that the regulations allow priorities to be administered prior to an *inter se* adjudication of

priority. Rather, the Legislature chose to grant quasi-judicial authority in administering priorities prior to final adjudication to the NMOSE, which was well within its discretion to do.

The Court further held that the AWRM regulations do not violate constitutional due process because they do not deprive the party challenging the regulations of a property right. As explained by the Court, a water right is a limited, usufructuary right providing only a right to use a certain amount of water established through beneficial use. As such, based on the long-standing principle that a water right entitles its holder to the use of water according to priority, regulation of that use by the State does not amount to a deprivation of a property right.

In addition to *Tri-State*, several other cases that address other aspects of the regulatory powers of the NMOSE have been decided recently. Priority administration was addressed in a case concerning the settlement agreement entered into by the United States, New Mexico (State), the Carlsbad Irrigation District (CID), and the Pecos Valley Artesian Conservancy District (PVACD) related to the use of the waters of the Pecos River. *State ex rel. Office of the State Engineer v. Lewis*, 2007-NMCA-008, 140 N.M. The issues in the case revolved around (1) the competing claims of downstream, senior surface water users in the Carlsbad area and upstream, junior groundwater users in the Roswell Artesian Basin and (2) the competing claims of New Mexico and Texas users. Through the settlement agreement, the parties sought to resolve these issues through public funding, without offending the doctrine of prior appropriation and without resorting to a priority call.

The settlement agreement was, in essence, a water conservation plan designed to augment the surface flows of the lower Pecos River in order to (1) provide an increased and more stable water supply to the CID, (2) meet the State's obligations to Texas under the 1948 Pecos River Compact (Compact) and the 1988 United States Supreme Court Decree, and (3) limit the circumstances under which the United States and CID would be entitled to make a call for the administration of water right priorities. The agreement included the development of two well fields and pipeline systems to facilitate the physical delivery of groundwater directly into the Pecos River under certain conditions, the purchase and transfer to the well field of existing groundwater rights in the Roswell UWB by the State, and the purchase and retirement of irrigated land within PVACD and CID.

The Court of Appeals framed the issue as whether the priority call procedure is the exclusive means under the doctrine of prior appropriation to resolve existing and projected future water shortage issues. The Court held that Article XVI, Section 2 of the Constitution, which states that "[p]riority of appropriation shall give the better right," and Article IX of the Compact, which states that "[i]n maintaining the flows at the New Mexico-Texas state line required by this compact, New Mexico shall in all instances apply the principle of prior appropriation within New Mexico," do not require a priority call as the sole response to water shortage concerns. The Court found it reasonable to construe these provisions to permit flexibility within the prior

appropriation doctrine in attempting to resolve longstanding water issues. Thus, the more flexible approach pursued by the settling parties through the settlement agreement was not ruled out in the Constitution, the Compact, or case precedent.

In relation to the NMOSE's regulatory authority over supplemental wells, in *Herrington v. State of New Mexico ex rel. State Engineer*, 2006-NMSC-014, 139 N.M. 368, the New Mexico Supreme Court clarified certain aspects of the *Templeton* doctrine. The *Templeton* doctrine allows senior surface water appropriators impaired by junior wells to drill a supplemental well to offset the impact to their water right. *See Templeton v. Pecos Valley Artesian Conservancy District*, 1958-NMSC-131, 65 N.M. 59. According to *Templeton,* drilling the supplemental well allows the senior surface right owner to keep their surface water right whole by drawing upon groundwater that originally fed the surface water supply. Thus the *Templeton* doctrine permits both the aggrieved senior surface appropriator and the junior user to divert their full share of water. The requirements for a successful *Templeton* supplemental well include (1) a valid surface water right, (2) surface water fed in part by groundwater (baseflow), (3) junior appropriators intercepting that groundwater by pumping, and (4) a proposed well that taps the same groundwater source of the applicant's original appropriation.

In *Herrington* the Court clarified that the well at issue would meet the *Templeton* requirements if it was dug into the same aquifer that fed the surface water. The Court also clarified whether a *Templeton* well could be drilled upstream of the surface point of diversion. The Court determined that the proper placement of a *Templeton* well must be considered on a case-by-case basis, and that these supplemental wells are not necessarily required to be upstream in all cases.

Lastly, the Court addressed the difference between a *Templeton* supplemental well and a statutory supplemental well drilled under NMSA 1978, Sections 72–5–23, -24 (1985). The Court found that a statutory transfer must occur within a continuous hydrologic unit, which differs from the narrow *Templeton* same-source requirement. Although surface to groundwater transfers require a hydrologic connection, this may be a more general determination than the *Templeton* baseflow source requirement. Further, *Templeton* supplemental wells service the original parcel, while statutory transfers may apply to new uses of the water, over significant distances.

Also related to the NMOSE's regulatory authority, the Court of Appeals addressed unperfected water rights in *Hanson v. Turney*, 2004-NMCA-069, 136 N.M. 1. In *Hanson,* a water rights permit holder who had not yet applied the water to beneficial use sought to transfer her unperfected water right from irrigation to subdivision use. The State Engineer denied the application because the water had not been put to beneficial use. The permit holder argued that pursuant to NMSA 1978, Section 72-12-7(A) (1985), which allows the owner of a "water right" to change the use of the water upon application to the State Engineer, the State Engineer had wrongly rejected her application. The Court upheld the denial of the application, finding that

under western water law the term "water right" does not include a permit to appropriate water when no water has been put to beneficial use. Accordingly, as used in Section 72-12-7(A) the term "water right" requires the perfection of a water right through beneficial use before a transfer can be allowed.

4.1.1.2 Legal Review of NMOSE Determinations

In *Lion's Gate Water v. D'Antonio,* 2009-NMSC-057, 147 N.M. 523, the Supreme Court addressed the scope of the district court's review of the State Engineer's determination that no water is available for appropriation. In *Lion's Gate*, the applicant filed a water rights application, which the State Engineer rejected without publishing notice of the application or holding a hearing, finding that no water was available for appropriation. The rejected application was subsequently reviewed in an administrative proceeding before the State Engineer's hearing examiner. The hearing examiner upheld the State Engineer's decision on the grounds that there was no unappropriated water available for appropriation.

This ruling was appealed to the district court, which determined that it had jurisdiction to hear all matters either presented or that might have been presented to the State Engineer, as well as new evidence developed since the administrative hearing. The NMOSE disagreed, arguing that only the issue of whether there was water available for appropriation was properly before the district court. The Supreme Court agreed with the NMOSE. The Court found that the comprehensive nature of the water code's administrative process, its mandate that a hearing must be held prior to any appeal to district court, and the broad powers granted to the State Engineer clearly express the Legislature's intent that the water code provide a complete and exclusive means to acquire water rights. Accordingly, the NMOSE was correct that the district court's *de novo* review of the application was limited to what the State Engineer had already addressed administratively, in this case whether unappropriated water was available.

The Court also held that the water code does not require publication of an application for a permit to appropriate if the State Engineer determines no water is available for appropriation, because no third-party rights are implicated unless water is available. If water is deemed to be available, the State Engineer must order notice by publication in the appropriate form.

Based in large part on the holding in *Lion's Gate*, the New Mexico Court of Appeals in *Headon v. D'Antonio*, 2011-NMCA-058, 149 N.M. 667, held that a water rights applicant is required to proceed through the administrative process when challenging a decision of the State Engineer. In *Headon* the applicant challenged the NMOSE's determination that his water rights were forfeited. To do so, he filed a petition seeking declaratory judgment as to the validity of his water rights in district court, circumventing the NMOSE administrative hearing process. 2011-NMCA-058, ¶¶ 2-3. The Court held that the applicant must proceed with the administrative hearing, along with its *de novo* review in district court, to challenge the findings of the NMOSE.

Legal review of NMOSE determinations was also an issue in *D'Antonio v. Garcia*, 2008-NMCA-139,145 N.M. 95, where the Court of Appeals made several findings related to NMOSE administrative review of water rights matters. *Garcia* involved an NMOSE petition to the district court for enforcement of a compliance order after the NMOSE hearing examiner had granted a motion for summary judgment affirming the compliance order. 2008-NMCA-139, ¶¶ 2-5. The Court first found that the right to a hearing granted in NMSA 1978, ¶ 72-2-16 (1973), did not create an absolute right to an administrative hearing. Rather, the NMOSE hearing contemplated in Section 72-2-16 could be waived if a party did not timely request such a hearing. *Id*. ¶ 9). In *Garcia* the defendant had not made such a timely request and therefore was not entitled to a full administrative hearing prior to issuance of an order by the district court.

The Court also examined the regulatory powers of the NMOSE hearing examiner; specifically, whether 19.25.2.32 NMAC allows the hearing examiner to issue a final order without the express written consent of the State Engineer. *Id*. ¶¶ 11-15). The Court held that the regulation allowed the hearing examiner to dismiss a case without the express approval of the State Engineer *Id*. ¶ 14. Finally, the Court held that the NMOSE hearing examiner may dismiss a case without full hearing when a party willfully fails to comply with the hearing examiner's orders. *Id*. ¶¶ 17-18). Accordingly, the Court in *Garcia* upheld the NMOSE hearing examiner's action to issue a compliance order without a full administrative hearing or final approval by the State Engineer. As such, the district court had the authority to enforce that compliance order.

4.1.1.3 Beneficial Use of Water – Non-Consumptive Use

Carangelo v. Albuquerque-Bernalillo County Water Utility Authority, 2014-NMCA-032, addressed whether a non-consumptive use of water qualifies as a beneficial use under New Mexico law and, accordingly, can be the basis for an appropriation of such water. In *Carangelo*, the NMOSE granted the Albuquerque-Bernalillo County Water Utility Authority's (Authority's) application to divert approximately 45,000 acre-feet per year of Rio Grande surface water, to which the Authority had no appropriative right. The Authority intended to use the water for the non-consumptive purpose of "carrying" the Authority's own San Juan-Chama Project water, Colorado River Basin water to which the Authority had contracted for use of, to a water treatment plant for drinking water purposes. The Court of Appeals found the NMOSE erred in granting the application because the application failed to seek a new appropriation. The Authority's application sought to divert water, to which the Authority asserted no prior appropriative right, which required a new appropriation. Moreover, the Authority affirmatively asserted no beneficial use of the water. The Court remanded the matter to the NMOSE to issue a corrected permit.

The Court's decision included the following legal conclusions:

- A new non-consumptive use of surface water in a fully appropriated system requires a new appropriation of water. A "non-consumptive use" is a type of water use where either

there is no diversion from a source body or there is no diminishment of the source. Neither the New Mexico Constitution nor statutes governing the appropriation of water distinguish between diversion of water for consumptive and non-consumptive uses. Because both can be beneficial uses, New Mexico's water law applies equally to either.

- The Authority did not need to file for a change in place or purpose of use for the diversion of its San Juan-Chama Project water. The Court stated that the San Juan-Chama Project water does not come from the Rio Grande Basin, and the Authority's entitlement to its beneficial use is not within the administrative scope of the Rio Grande Basin. Accordingly, the Authority already had an appropriative right to that water and did not need to file an application with the NMOSE for its use.

4.1.1.4 Impairment

Montgomery v. Lomos Altos, Inc., 2007-NMSC-002, 141 N.M. 21, involved applications to transfer surface water rights to groundwater points of diversion in the fully appropriated Rio Grande stream system. In order for a transfer to be approved, an applicant must show, among other factors, that the transfer will not impair existing water uses at the move-to location. In *Lomos Altos*, several parties protested the NMOSE's granting of the applications, arguing that surface depletions at the move-to location caused by the applications should be considered *per se* impairment of existing rights. The Court found that questions of impairment are factual and cannot be decided as a matter of law, but must be determined on a case-by-case basis. In doing so, the Court held that surface depletions in a fully appropriated stream system do not result in *per se* impairment, but the Court noted that under some circumstances, even *de minimis* depletions can lead to a finding of impairment. The Court further found that in order to determine impairment, all existing water rights at the "move-to" location must be considered.

4.1.1.5 Rights Appurtenant to Water Rights

The New Mexico Supreme Court has issued three recent opinions dealing with appurtenancy. *Hydro Resources Corp. v. Gray*, 2007-NMSC-061, 143 N.M. 142, involved a dispute over ownership of water rights developed by a mining lessee in connection with certain mining claims owned by the lessor. The Supreme Court held that under most circumstances, including mining, water rights are not considered appurtenant to land under a lease. The sole exception to the general rule that water rights are separate and distinct from the land is water used for irrigation. Therefore, a lessee can acquire water rights on leased land by appropriating water and placing it to beneficial use. Those developed rights remain the property of the lessee, not the lessor, unless stipulated otherwise in an agreement.

In a case examining whether irrigation water rights were conveyed with the sale of land or severed prior to the sale (*Turner v. Bassett*, 2005-NMSC-009, 137 N.M. 381), the Supreme Court examined New Mexico's transfer statute, NMSA 1978, Section 72-5-23 (1941), along with the NMOSE regulations addressing the change of place or purpose of use of a water right,

19.26.2.11(B) NMAC. In *Turner* the Court found that the statute, coupled with the applicable regulations and NMOSE practice, requires consent of the landowner and approval of the transfer application by the State Engineer for severance to occur. The issuance of a permit gives rise to a presumption that the water rights are no longer appurtenant to the land. A landowner who holds water rights and follows the statutory and administrative procedures to effect a severance and initiate a transfer may convey the land severed from its former water rights, without necessarily reserving those water rights in the conveyance documents.

In *Walker v. United States*, 2007-NMSC-038, 142 N.M. 45, the New Mexico Supreme Court examined the issue of whether a water right includes an implicit right to graze. After the U.S. Forest Service canceled the Walkers' grazing permits, the Walkers filed a complaint arguing that the United States had taken their property without just compensation in violation of the Fifth Amendment to the United States Constitution. The Walkers asserted a property right to the allotments under New Mexico state law. Specifically, the Walkers argued that the revocation of the federal permit resulted in the loss of "water, forage, and grazing" rights based on New Mexico state law and deprived them of all economically viable use of their cattle ranch.

The Court found that a stock watering right does not include an appurtenant grazing right. In doing so, the Court addressed in depth the long understood principle in western water law that water rights, unless used for irrigation, are not appurtenant to the land on which they are used. The Court also clarified that the beneficial use for which a water right is established does not guarantee the water right owner an interminable right to continue that same beneficial use. The Walkers could have transferred their water right to another location or another use if they could not continue with the original uses. For these reasons, the Court rejected the Walkers' attempt to make an interest in land incident or appurtenant to a water right.

4.1.1.6 Deep, Non-Potable Aquifers

In 2009 the New Mexico Legislature amended NMSA 1978, Section 72-12-25 (2009), to provide for administrative regulation of deep, non-potable aquifers. These groundwater basins are greater than 2,500 deep and contain greater than 1,000 parts per million of total dissolved solids. Drilling wells into such basins had previously been unregulated. The amendment requires the NMOSE to conduct hydrologic analysis on well drilling in these basins. The type of analysis required by the NMOSE depends on the use for the water.

4.1.1.7 Domestic Wells

New Mexico courts have recently decided several significant cases addressing domestic well permitting, and the NMOSE also recently amended its regulations governing domestic wells.

In *Bounds v. State ex. rel D'Antonio*, 2013-NMSC-037, the New Mexico Supreme Court upheld the constitutionality of New Mexico's Domestic Well Statute (DWS), NMSA 1978, Section 72-12-1.1 (2003). Bounds, a rancher and farmer in the fully appropriated and

adjudicated Mimbres basin, and the New Mexico Farm and Livestock Bureau (Petitioners), argued that the DWS was facially unconstitutional. The DWS states that the NMOSE "shall issue" domestic well permits, without determining the availability of unappropriated water or providing other water rights owners in the area the ability to protest the well. The Petitioners argued that this practice violated the New Mexico constitutional doctrine of prior appropriation to the detriment of senior water users, as well as due process of law. The Court held that the DWS does not violate the doctrine of prior appropriation set forth in the New Mexico Constitution. The Court also held that Petitioners failed to adequately demonstrate any violation of their due process rights.

In addressing the facial constitutional challenge, the Court rejected the Petitioners' argument that the New Mexico Constitution mandates that the statutory requirements of notice, opportunity to be heard, and a prior determination of unappropriated waters or lack of impairment be applied to the domestic well application and permitting process. The Court reasoned that the DWS creates a different and more expedient permitting procedure for domestic wells and the constitution does not require a particular permitting process, or identical permitting procedures, for all appropriations. While holding that the DWS was valid in not requiring the same notice, protest, and water availability requirements as other water rights applications, the court confirmed that domestic well permits can be administered in the same way as all other water rights. In other words, domestic wells do not require the same rigors as other water rights when permitted, but when domestic wells are administered, constitutionally mandated priority administration still applies. Thus the DWS, which deals solely with permitting and not with administration, does not conflict with the priority administration provisions of the New Mexico Constitution.

The Court also found that the Petitioners failed to prove a due process violation because they did not demonstrate how the DWS deprived them of their water rights. Specifically, Bounds failed to show any actual impairment, or imminent future impairment, of his water rights. Bounds asserted that any new appropriations must necessarily cause impairment in a closed and fully appropriated basin, and therefore, granting any domestic well permit had the potential to impair his rights. The Court rejected this argument, finding that impairment must be proven using scientific analysis, not simply conclusory statements based on a bright line rule that impairment always occurs when new water rights are permitted in fully appropriated basins.

Two other significant domestic well decisions addressed domestic well use within municipalities. In *Smith v. City of Santa Fe*, 2007-NMSC-055, 142 N.M. 786, the Supreme Court examined the authority of the City of Santa Fe to enact an ordinance restricting the drilling of domestic wells. The Court held that under the City's home rule powers, it had authority to prohibit the drilling of a domestic well within the municipal boundaries and that this authority was not preempted by existing state law.

Then in *Stennis v. City of Santa Fe,* 2008-NMSC-008, 143 N.M. 320, Santa Fe's domestic well ordinance was tested when a homeowner (Stennis) applied for a domestic well permit with the NMOSE, but did not apply for a permit from the City. In examining the statute allowing municipalities to restrict the drilling of domestic wells, the Court found that municipalities must strictly comply with NMSA 1978, Section 3–53–1.1(D) (2001), which requires cities to file their ordinances restricting the drilling of domestic water wells with the NMOSE. On remand, the Court of Appeals held that Section 3-53-1.1(D) does not allow for *substantial* compliance. *Stennis v. City of Santa Fe*, 2010-NMCA-108, 149 N.M. 92. Rather, strict compliance is required and the City must have actually filed a copy of the ordinance with the NMOSE.

In addition to the cases addressing domestic wells, the regulations governing the use of groundwater for domestic use were substantially amended in 2006 to clarify domestic well use pursuant to NMSA 1978, Section 72-12-1.1 (19.27.5.1 et seq. NMAC). The regulations:

1. Limit the amount of water that can be used pursuant to a new domestic well permit to:

    - 1.0 acre-feet per year (ac-ft/yr) for a single household use (can be increased to up to 3.0 ac-ft/yr if the applicant can show that the combined diversion from domestic wells will not impair existing water rights)
    - 1.0 ac-ft/yr for each household served by a well serving more than one household, with a cap of 3.0 ac-ft/yr if the well serves three or more households
    - 1.0 ac-ft/yr for drinking and sanitary purposes incidental to the operations of a governmental, commercial, or non-profit facility as long as no other water source is available. The amount of water so permitted is subject to further limitations imposed by a court or a municipal or county ordinance

    The amount of water that can be diverted from a domestic well can also be increased by transferring an existing water right to the well. 19.27.5.9 NMAC.

2. Require mandatory metering of all new domestic wells under certain conditions, such as when wells are permitted within a domestic well management area, when a court imposes a metering requirement, when the water use is incidental to the operations of a governmental, commercial, or non-profit facility, and when the well serves multiple households. 19.27.5.13(C) NMAC.

3. Allow for the declaration of domestic well management areas when hydrologic conditions require added protections to prevent impairment to valid, existing surface water rights. In such areas, the maximum diversion from a new domestic well cannot exceed, and may be less than, 0.25 ac-ft/yr for a single household and up to 3.0 ac-ft/yr for a multiple household well, with each household limited to 0.25 ac-ft/yr. The State Engineer has not declared any domestic well management areas in the planning region.

4.1.1.8 Water Project Financing

The Water Project Finance Act, Chapter 72, Article 4A NMSA 1978, outlines different mechanisms for funding water projects in water planning regions. The purpose of the Act is to provide for water use efficiency, resource conservation, and the protection, fair distribution, and allocation of New Mexico's scarce water resources for beneficial purposes of use within the state. The Water Project Finance Act creates two funds: the Water Project Fund, NMSA 1978, Section 72-4A-9 (2005), and the Acequia Project Fund, NMSA 1978, Section 72-4A-9.1 (2004). Both funds are administered by the New Mexico Finance Authority. The Water Trust Board recommends projects to the Legislature to be funded from the Water Project Fund.

The Water Project Fund may be used to make loans or grants to qualified entities (broadly defined to include public entities and Indian tribes and pueblos). To qualify for funding, the project must be approved by the Water Trust Board for one of the following purposes: (1) storage, conveyance or delivery of water to end users, (2) implementation of federal Endangered Species Act of 1973 collaborative programs, (3) restoration and management of watersheds, (4) flood prevention, or (5) water conservation or recycling, treatment, or reuse of water as provided by law. NMSA 1978, § 72-4A-5(B) (2011). The Water Trust Board must give priority to projects that (1) have been identified as being urgent to meet the needs of a regional water planning area that has a completed regional water plan accepted by the NMISC, (2) have matching contributions from federal or local funding sources, and (3) have obtained all requisite state and federal permits and authorizations necessary to initiate the project. NMSA 1978, § 72-4A-5.

The Acequia Project Fund may be used to make grants to acequias for any project approved by the Legislature.

The Water Project Finance Act directed the Water Trust Board to adopt regulations governing the terms and conditions of grants and loans recommended by the Board for appropriation by the Legislature from the Water Project Fund. The Board promulgated implementing regulations, 19.25.10.1 et seq. NMAC, in 2008. The regulations set forth the procedures to be followed by the Board and New Mexico Finance Authority for identifying projects to recommend to the Legislature for funding. The regulations also require that financial assistance be made only to entities that agree to certain conditions set forth in the regulations.

4.1.1.9 The Strategic Water Reserve

In 2005, the New Mexico Legislature enacted legislation to establish a Strategic Water Reserve, NMSA 1978, Section 72-14-3.3 (2007). Regulations implementing the Strategic Water Reserve statute were also implemented in 2005. 19.25.14.1 et seq. NMAC.

The statute authorizes the Commission to acquire water rights or storage rights to compose the reserve. Section 72-14-3.3(A). Water in the Strategic Water Reserve can be used for two purposes: (1) to comply with interstate stream compacts and (2) to manage water for the benefit

of endangered or threatened species or to avoid additional listing of species. Section 72-14-3.3(B). The NMISC may only acquire water rights that have sufficient seniority and consistent, historical beneficial use to effectively contribute to the purpose of the Reserve. The NMISC must annually develop river reach or groundwater basin priorities for the acquisition of water rights for the Strategic Water Reserve. The Middle Rio Grande is a priority basin for the NMISC.

4.1.1.10 Acequia Water Use

Two recent cases by New Mexico courts address the issue of acequia water use. *Storm Ditch v. D'Antonio*, 2011-NMCA-104, 150 N.M. 590, examined the process for transferring a landowner's water rights from a community acequia to a municipality. The Court found that actual notice of the transfer application to the acequia was not mandated by statute; instead, publication of the landowner's transfer application provided sufficient notice to the acequia to inform it of the proposed transfer. Further, the statute requiring that the transfer applicant file an affidavit stating that no rules or bylaws for a transfer approval had been adopted by the acequia was not intended to prove notice. Rather, the statute was directed at providing the State Engineer with assurance that the applicant had met all requirements imposed by acequia bylaws before action was taken on the application.

Pena Blanca Partnership v. San Jose Community Ditch, 2009-NMCA-016, 145 N.M. 555, involved attempts to transfer water rights from agricultural uses appurtenant to lands served by two acequias to non-agricultural uses away from the acequias. The acequias denied the water rights owners' (Owners') requests to make these changes pursuant to their authority under NMSA 1978, Section 73-2-21(E) (2003). The Owners appealed the acequias decision to district court. On appeal, the standard of review listed in Section 73–2–21(E) allowed reversal of the acequia commissioners only if the court found they had acted fraudulently, arbitrarily or capriciously, or not in accordance with law.

The Owners challenged this deferential standard of review in the Court of Appeals based on two grounds. First the Owners argued that the *de novo* review standard in Article XVI, Section 5 of the New Mexico Constitution applied to the proposed transfers at issue, not the more deferential standard found in Section 73-2-21(E). The Court disagreed and found that the legislature provided for another review procedure for the decisions of acequia commissioners by enacting Section 73–2–21(E).

The Owners' second assertion was that the deferential standard of review in Section 73-2-21(E) violated the equal protection clause of Article II, Section 18 of the New Mexico Constitution. The Owners argued that their equal protection guarantees were violated because water rights transfers out of acequias were treated differently than other water rights transfers. The court again disagreed, finding that although other determinations of water rights are afforded a *de novo*

hearing in the district court, since the Owners still had access to the courts and the right of appeal, there were no equal protection violations.

4.1.1.11 Water Conservation

Guidelines for drafting and implementing water conservation plans are set forth in NMSA 1978, Section 72-14-3.2 (2003). By statute, neither the Water Trust Board nor the New Mexico Finance Authority may accept an application from a covered entity (defined as municipalities, counties, and any other entities that supply at least 500 acre-feet per annum of water to its customers, but excluding tribes and pueblos) for financial assistance to construct any water diversion, storage, conveyance, water treatment, or wastewater treatment facility unless the entity includes a copy of its water conservation plan.

The water conservation statute primarily supplies guidance to covered entities, as opposed to mandating any particular action. For example, the statute provides that the covered entity determines the manner in which it will develop, adopt, and implement a water conservation plan. The statute further states that a covered entity "shall consider" either adopting ordinances or codes to encourage conservation, or otherwise "shall consider" incentives to encourage voluntary compliance with conservation guidelines. The statute then states that covered entities "shall consider, and incorporate in its plan if appropriate . . . a variety of conservation measures," including, in part, water-efficient fixtures and appliances, water reuse, leak repairs, and water rate structures encouraging efficiency and reuse. Section 72-14-3.2(D). Also, pursuant to NMSA 1978, §§ 72-5-28(G) (2002) and 72-12-8(D) (2002), when water rights are placed in a State Engineer-approved water conservation program, periods of nonuse of the rights covered in the plan do not count toward the four-year forfeiture period.

4.1.1.12 Municipal Condemnation

NMSA 1978, Section 3-27-2 (2009) was amended in 2009 to prohibit municipalities from condemning water sources used by, water stored for use by, or water rights owned or served by an acequia, community ditch, irrigation district, conservancy district, or political subdivision of the state.

4.1.1.13 Subdivision Act

The Subdivision Act, NMSA 1978, Section 47-6-11.2 (2013), was amended in 2013 to require proof of water availability prior to final approval of a subdivision plat. Specifically, the subdivider must (1) present the county with NMOSE-issued water use permits for the subdivision or (2) prove that the development will hook up to a water provider along with an opinion from the State Engineer that the subdivider can fulfill the water use requirements of the Subdivision Act. Previously the county had discretion to approve subdivision plats without such proof that the water rights needed for the subdivision were readily available. These water use requirements apply to all subdivisions of ten or more lots. The Act was also amended to prohibit approval of a subdivision permit if the water source for the subdivision is domestic wells.

4.1.2 State Water Laws and Administrative Policies Affecting the Region

In New Mexico, water is administered generally by the State Engineer, who has the "general supervision of waters of the state and of the measurement, appropriation, distribution thereof and such other duties as required." NMSA 1978, § 72-2-1 (1982). To administer water throughout the state the State Engineer has several tools at its disposal, including designation of water masters, declaration of UWBs, and use of the AWRM rules, all of which are discussed below, along with other tools used to manage water within regions.

4.1.2.1 Water Masters

The State Engineer has the power to create water master districts or sub-districts by drainage area or stream system and to appoint water masters for such districts or sub-districts. NMSA 1978, § 72-3-1 (1919). Water masters have the power to apportion the waters in the water master's district under the general supervision of the State Engineer and to appropriate, regulate, and control the waters of the district to prevent waste. NMSA 1978, § 72-3-2 (2007). Currently, two water masters have been assigned to the Nambe-Pojoaque-Tesuque basin in the Jemez y Sangre planning region.

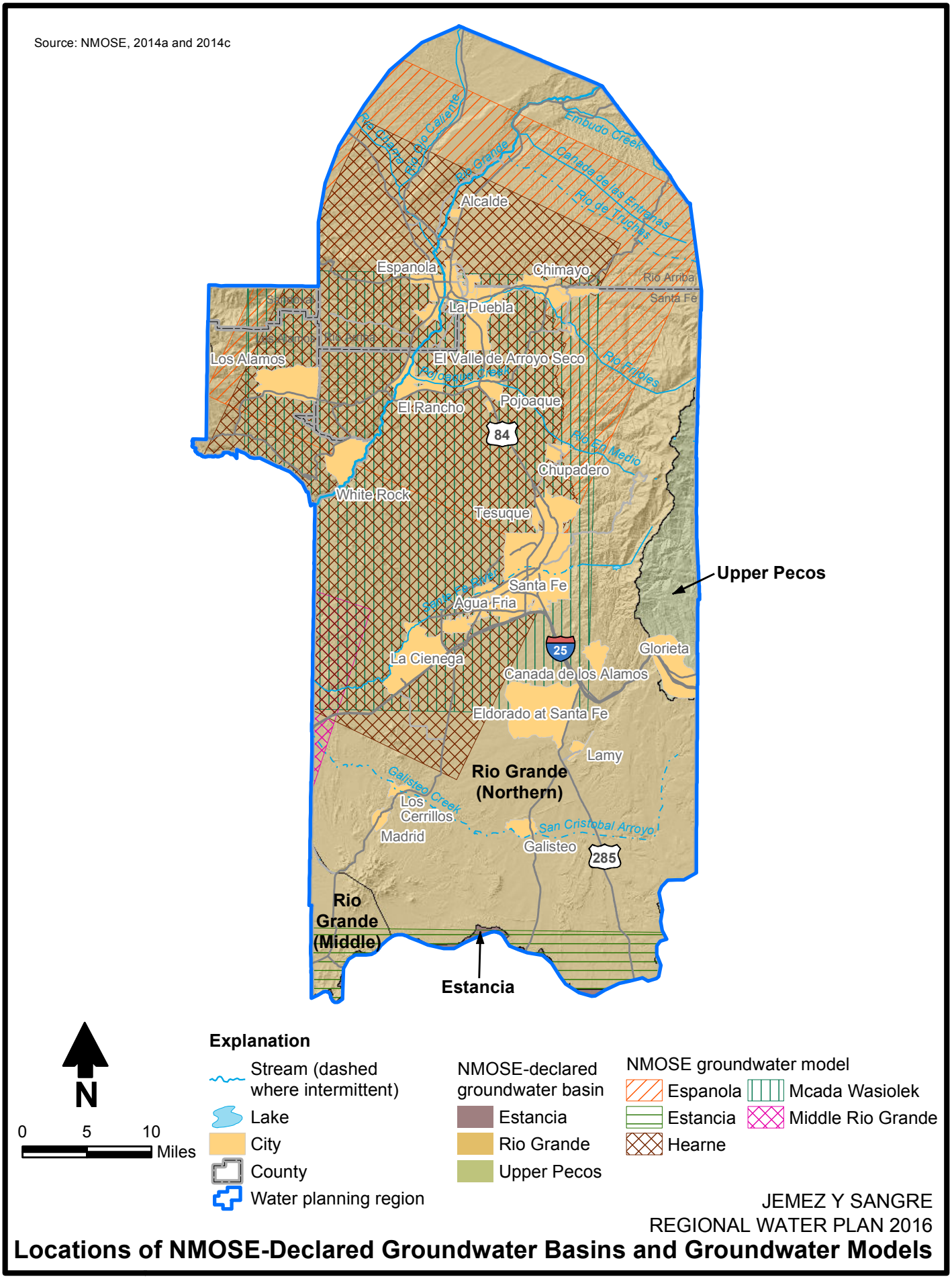
4.1.2.2 Groundwater Basin Guidelines

The NMOSE has declared UWBs and implements guidelines in those basins for the purpose of carrying out the provisions of the statutes governing underground waters. *See* NMAC 19.27.48.6. The UWBs within the Jemez y Sangre Basin are the Rio Grande, Upper Pecos, and a very small portion of Estancia (Figure 4-1). There are no specific guidelines governing appropriations in the Rio Grande and Upper Pecos UWBs.

In 2002, new guidelines were established for the Estancia UWB. The *Estancia Underground Water Basin Guidelines for Review of Water Right Applications* (NMOSE, 2002) specify the criteria for administering existing water rights within designated critical management areas through evaluating resulting water levels and the rate of water level decline on both a regional and local basis. The Guidelines use two approaches to administer water in the basin. In aquifers with a relatively thin saturated thickness, declines are limited to a prescribed level over a prescribed period. In aquifers with a relatively thick saturated thickness, the rate of groundwater decline is limited in areas designated as critical management areas due to water declines of 1.5 feet per year or greater or an expected saturated thickness below 80 feet by 2040.

4.1.2.3 AWRM Implementation in the Basin

The Nambe-Pojoaque-Tesuque basin has been designated as a priority basin for implementation of AWRM regulations in the planning region. AWRM regulations are being promulgated under the Settlement Agreement in *Aamodt* (Section 4.1.3.5).



JEMEZ Y SANGRE
REGIONAL WATER PLAN 2016

Locations of NMOSE-Declared Groundwater Basins and Groundwater Models

Figure 4-1

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4.1.2.4 Special Districts in the Basin

Special districts are various districts within the region having legal control over the use of water in that district. All are subject to specific statutes or other laws concerning their organization and operation. In the Jemez y Sangre planning region, special districts include several acequias, which are governed by NMSA 1978, Sections 73-2-1 through 68, and soil and water conservation districts, which are governed by NMSA 1978, Sections 73-20-25 through 48. Additionally, the region includes several irrigation districts (governed by NMSA 1978, §§ 73-9-1 through -62) and water and sanitation districts (governed by NMSA 1978, §§ 73-21-1 through -55), including the Pojoaque Valley Irrigation District, the Santa Cruz Irrigation District, and the Eldorado Water & Sanitation District.

4.1.2.5 State Court Adjudications

Anaya, et al. v. Public Service Company of New Mexico and State of New Mexico, No. SF-71-43,347(CIV) is currently pending. The adjudication will quantify all the water rights in the Santa Fe River system, including the City of Santa Fe's. While orders on most of the water rights have been entered in the proceedings, the City's water rights are still outstanding and there has been little action in the case recently.

4.1.3 Federal Water Laws

The law of water appropriation has been developed primarily through decisions made by state courts. Since the accepted plan was published in 2003 several federal cases have been decided examining various water law questions. These cases are too voluminous to include here, and many of the issues in the cases will not apply directly to the region. However, New Mexico is a party to one original jurisdiction case in the U.S. Supreme Court involving the Rio Grande Compact and waters of the Lower Rio Grande. Because of its importance to the entire state, especially those regions that include the Rio Grande as a surface water source like the Jemez y Sangre, it is included here.

In *Texas v. New Mexico and Colorado*, No. 141 Original (U.S. Supreme Court, 2014), Texas alleges that New Mexico has violated the Rio Grande Compact by intercepting water Texas is entitled to under the Compact through groundwater pumping and surface water diversions downstream of Elephant Butte Reservoir but upstream of the New Mexico-Texas state line. Colorado is also a defendant in the lawsuit as it is a signatory to the Rio Grande Compact. The United States has intervened as a Plaintiff in the case. Elephant Butte Irrigation District (EBID) and El Paso County Water Improvement District Number One (EPCWID #1) have both sought to intervene in the case as well, claiming that their interests are not fully represented by the named parties. The motions to intervene along with a motion to dismiss filed by New Mexico are currently pending.

4.1.3.1 Federal Reservations

The doctrine of federally reserved water rights was developed over the course of the 20th Century. Simply stated, federally reserved rights are created when the United States sets aside land for specific purposes, thereby withdrawing the land from the general public domain. In doing so, there is an implied, if not expressed, intent to reserve an amount of water necessary to fulfill the purpose for which the land was set aside. Federally reserved water rights are not created, or limited, by state law.

Federally reserved water rights on Indian lands are known as "*Winters* reserved rights." The *Winters* Doctrine provides that at the time the United States established an Indian reservation, it also reserved sufficient water to provide for the reservation as a permanent homeland. *Winters v. United States*, 207 U.S. 564 (1908). Neither the priority date nor the amount of *Winters* reserved rights is based on the historical actual beneficial use of water. Under the *Winters* Doctrine, the priority date is based on the date the federal government established the Indian reservation. A *Winters* reserved right is quantified based on the amount of water needed to fulfill the purposes of the reservation. In 1963, the U.S. Supreme Court adopted the "practically irrigable acreage" standard for quantifying federal Indian reserved water rights through a determination of the number of acres that can be practically or feasibly irrigated on the reservation. *Arizona v. California*, 376 U.S. 546 (1963). In New Mexico, courts have faced a different question in the determination of Pueblo Indian water rights. Although one federal district court recognized historically irrigated acreage as the basis for determining the quantity of a pueblo's water right, there is no established law for determining Pueblo Indian water rights. *See New Mexico ex rel. State Engineer v. Aamodt, et al.*, 6:6-CV-6639 (D.N.M.).

Lands with federal reserved rights or aboriginal rights within the Jemez y Sangre planning region include the following:

- The eight Pueblos in the region:
  - Ohkay Owingeh
  - Cochiti
  - Pojoaque
  - Kewa
  - Nambe
  - San Ildefonso
  - Santa Clara
  - Tesuque
- Carson National Forest
- Santa Fe National Forest
- National Forest Service Wilderness Areas

- National Park Service Wilderness Areas
- Bandelier National Monument (National Park Service)
- Valles Caldera National Preserve
- Los Alamos National Laboratory (Department of Energy)
- Bureau of Land Management Lands

4.1.3.2 Interstate Stream Compacts

Interstate compacts become federal law once ratified by Congress. Three compacts allocate water in the region—the Rio Grande, Upper Colorado River, and Colorado River compacts—and are discussed in Section 4.1.6 of the 2003 Plan.

As discussed above, the three party states to the Rio Grande Compact are currently involved in litigation over allegations by Texas that New Mexico has violated the terms of the Compact. The allegations primarily involve actions in the Lower Rio Grande of New Mexico. However, the outcome of the suit may affect the upper reaches of the Rio Grande in New Mexico, especially as related to storage and relinquishment credits.

4.1.3.3 Treaties

One treaty indirectly governs water use in the Jemez y Sangre Region: the Convention with Mexico, May 21, 1906, 34 Stat. 2953, T.S. No. 455, 1 Malloy 1202. This treaty provides for the distribution between the United States and Mexico of the waters of the Rio Grande in the international reach of the river between the El Paso-Juárez Valley and Fort Quitman, Texas. Although this reach is below the Jemez y Sangre region, any use of water upstream of this reach may impact the downstream distribution of water.

Also of importance to water rights in the region is the Treaty of Guadalupe Hidalgo, entered into on February 2, 1848 between the United States and Mexico. 9 Stat. 922. The treaty provides that "property of every kind" of the Mexicans shall be "inviolably respected," including water rights in the region established prior to 1848.

4.1.3.4 Federal Water Projects

The San Juan-Chama Project is an extremely important federal project in the planning region. The Project was discussed in depth in the 2009 RWP update.

4.1.3.5 Federal Adjudications in the Basin

In the Jemez y Sangre region, the Nambe/Pojoaque/Tesuque adjudication *(State of New Mexico v. Aamodt, et al.,* No. 66cv06639 MV/WPL) is pending in federal court. On May 3, 2006, the State of New Mexico, the Pueblos of Nambe, Tesuque, Pojoaque, and San Ildefonso, the County of Santa Fe, and the City of Santa Fe executed a Settlement Agreement to resolve the claims of the four Pueblos to the use of waters in the Nambe-Pojoaque-Tesuque (N-P-T) stream system, a

tributary of the Rio Grande in north-central New Mexico. Federal legislation approving the Settlement Agreement was enacted into law on December 8, 2010. The settlement finally determines the water rights of the four Pueblos in the ongoing adjudication of water rights in the N-P-T system. While most of the Pueblos' water rights are adjudicated with senior priorities, the Settlement Agreement provides protections for non-Pueblo junior water rights through four major provisions:

1. The Pueblos are limited from making priority calls against non-Pueblo surface water rights except under certain circumstances, thereby protecting existing surface water uses in the N-P-T.

2. The United States is acquiring up to 2,500 acre-feet per year of additional water for the Pueblos' economic development, reducing the demand on water supplies in the basin.

3. A regional water system is authorized to be constructed by the United States to deliver potable water from a purification plant near Otowi through the Nambe-Pojoaque-Tesuque valley to the Pueblos and non-Pueblo communities along its route.

4. Non-Pueblo parties currently using domestic wells will have the option to stop using groundwater and instead connect to the regional water system for their domestic water uses.

The system is to be funded by the United States, the State of New Mexico, and Santa Fe County, and will be overseen by a regional water authority with representatives from the Pueblos and the County. The portion of the system that will serve non-Pueblo water users in the basin will be funded by the State and the County of Santa Fe and is currently projected to deliver up to about 1,500 acre-feet per year, although this capacity may be reduced if the County determines that non-Pueblo demand for water from the system will be less.

After conducting an expedited *inter se* proceeding, the Aamodt adjudication court entered a Partial Final Judgment and Decree adjudicating the Pueblos' water rights according to the terms of the conformed Settlement Agreement. An Order to Show Cause providing notice of the proceeding to all water rights claimants in the N-P-T stream system of their opportunity to approve or object to the settlement and the proposed Partial Final Judgment and Decree was published and mailed to close to 7,000 water right claimants in the basin in January and February 2014. By the objection filing deadline of April 7, 2015, more than 750 objections and nearly 400 acceptances had been filed. Briefing on the objections has been completed and the parties are waiting for a decision from the court. The deadline for filing acceptances has not yet been set by the court.

The Aamodt Settlement Act set September 15, 2017 as the deadline for the court to enter both the Partial Final Judgment and Decree on the Pueblos' water rights and a Final Judgment and Decree on all water rights in the Aamodt adjudication. The outcome of the adjudication will remain an important issue to water planning in the region.

4.1.4 Tribal Law

There are eight pueblos in the Jemez y Sangre region: Cochiti, Nambe, Pojoaque, San Ildefonso, Ohkay Owingeh, Santa Clara, Kewa, and Tesuque. A few of the Pueblos have tribal water codes. For instance, Pojoaque Pueblo regulates water use through its Law and Order Code, Sections T-6(e)(20) and (21) and (f)(4) of which prohibit the waste of water, encourage water conservation, and mandate limitations on water use during water shortages.

4.1.5 Local Law

Local laws addressing water use have been implemented by both municipalities and counties within the planning region.

4.1.5.1 Rio Arriba County

Water use in Rio Arriba County is guided by the *Rio Arriba County Comprehensive Plan* and its subdivision regulations.

The Comprehensive Plan (Community By Design, 2009) focuses on water issues in the County and sets forth a number of goals relating to water use and strategies to meet those goals. The major priorities set forth in the Plan are to keep water within the County to foster long-standing agricultural traditions, sustain the acequia system, and provide safe and adequate drinking water into the future. The Plan sets forth a number of strategies to meet the County's goal of protecting, maintaining, and strengthening the relationship between land and water. These strategies include acquiring water rights at risk of loss and placing them to beneficial use, encouraging the adjudication of water rights of all acequias in the County to include historical uses, customs and practices, encouraging acequias to adopt bylaws governing the transfer of acequia rights, encouraging acequias and mutual domestic providers to work with the County, the NMOSE, and tribal governments to establish conservation and restoration programs, and mapping and inventorying water resources in the County. The Plan also sets as a goal the protection of the County's water supply and quality, and to do so, encourages water conservation measures as well as community water and wastewater systems.

The County's Subdivision Regulations require that a subdivider show that sufficient water is available to fulfill the maximum water requirements of the subdivision and provide a water supply plan including conservation, water quality, and fire protection components. Art. VII, §2 and Appendix A. For all subdivisions containing 20 or more parcels any one of which is 2 acres or less in size, the subdivider must provide a State Engineer permit allowing subdivision water use.

4.1.5.2 City of Española

Water use in the City of Española is regulated by ordinances set forth in the Code of the City of Española. Section 311.10 of the Code prohibits the use of domestic wells within 300 feet of a

municipal water line. Sections 311.22 and 23 include requirements for the transfer of groundwater rights to the City or the payment of a fee in order to obtain City water service. Chapter 315 of the Code defines water emergencies (including various stages of emergency) and includes a Water Emergency Management Plan.

4.1.5.3 Los Alamos County

Water use in Los Alamos County is guided by the County's *Energy and Water Conservation Plan* (Los Alamos County, 2013) and its rules and regulations.

The *Energy and Water Conservation Plan* meets several County objectives, including the adoption of reasonable and appropriate conservation goals and the development of cost-effective conservation programs. The plan recognizes the impact of the Los Alamos National Laboratory (LANL) on the County's conservation efforts. (LANL has a site-wide Water Conservation Program Plan that maintains a target water consumption goal and emphasizes using existing water more efficiently.) The County plan discusses the use of treated effluent to irrigate public facilities in the County and the County's intention to prepare a Non-Potable Water System Master Plan. The plan also outlines conservation incentives, such as irrigation and commercial water conservation audits and residential water conservation outreach.

4.1.5.4 City of Los Alamos

The City of Los Alamos does not have a water code or ordinances.

4.1.5.5 Santa Fe County

Water use in Santa Fe County is guided by the *Santa Fe County Water Conservation Plan* (Santa Fe County, 2010), the *Santa Fe County Conjunctive Management Plan for the Santa Fe Basin* (Santa Fe County, 2009), the *Santa Fe County Sustainable Growth Management Plan* (Santa Fe County, 2010), and by several County ordinances.

The Water Conservation Plan was compiled to (1) meet the requirements set out by the U.S. Bureau of Reclamation for water conservation planning and (2) fulfill the statutory requirement for water conservation planning for the State of New Mexico in response to a permit condition imposed by the New Mexico State Engineer. The plan is defined and organized by sub-basins within the Santa Fe County boundaries. The plan outlines the following goals for the County: conserve water through current ordinances and programs and through the development of future ordinances and regulations as needed, provide guidance on best water management practices, incorporate new water conservation technologies, integrate low water use practices, and protect water resources. The plan includes existing water conservation ordinances, ways to expand on the existing water conservation practices, future planned initiatives, an implementation schedule, and funding sources. Future implementation activities include (1) identifying water conservation audiences, (2) seeking technical assistance, (3) developing ordinances for rain, storm, gray and black water harvesting, and (4) conducting water conservation research programs.

The purpose of the *Conjunctive Management Plan for the Santa Fe Basin* is to set forth principles and planning objectives to guide the management of the County's water resources supplied from multiple sources. The plan is intended to provide information to support the County's growth management strategy of sustainable growth and to guide similar planning efforts. The plan includes discussion of the Buckman Direct Diversion Project and conjunctive aquifer management.

The *Santa Fe County Sustainable Growth Management Plan* (SGMP) provides the future direction for the County over planning, environmental protection, public facilities and services, fiscal planning, land use, housing, resource conservation, renewable energy and green development policies, administrative regulation, and development application processes. The SGMP devotes one chapter to water and discusses the following key issues relating to water use: encouraging land use and development consistent with water management and environmental and hydrologic capabilities and constraints, incorporating water conservation and reclamation measures into new development, reducing County-wide per capita water consumption, protecting groundwater as the County's secondary source of water supply, and providing a long-term sustainable water supply to meet current and future needs.

Santa Fe County regulates water use by ordinance. Subchapter 51 of the Santa Fe County Code of Ordinances (Code) deals with water conservation, including prohibiting water wasting actions and listing fines for various types of water waste. Section 51.04 of the Code outlines outdoor conservation measures, including time of day watering restrictions from May through September. Section 51.05 of the Code outlines indoor conservation measures, including leak repair requirements, plumbing fixture requirements, and hotel and restaurant requirements. Section 51.07 of the Code outlines the County's domestic well use metering program. Section 51.08 of the Code specifically defines and prohibits water waste and "fugitive water."

The County's Sustainable Land Development Code (Section 7.13) outlines water supply requirements for all development within the County, including water supply and water conservation requirements for connection to water and wastewater systems.

4.1.5.6 City of Santa Fe

Water use in the City of Santa Fe is governed by the Comprehensive Water Conservation Requirements Ordinance. SFCC 1987 § 25-2.2. The purpose of the ordinance is to provide the City the means to reduce per capita water demands by requiring its citizens and businesses to comply with prescribed water conservation regulations and by establishing financial incentives for water conservation. The ordinance adopts water rates, establishes indoor water conservation requirements such as minor leak repair and plumbing standards, establishes outdoor water conservation requirements such as time of day watering restrictions and use of treated wastewater, restricts the use of turf, prohibits the waste of water, defines the concept of "Water Emergency," and adopts a Water Emergency Management Plan. Domestic wells within the jurisdiction of the City of Santa Fe are governed by this ordinance.

4.2 Relevant Environmental Law

4.2.1 Species Protection Laws

4.2.1.1 Federal Endangered Species Act

The Endangered Species Act (ESA) can have a tremendous influence on the allocation of water, especially of stream and river flows. 16 U.S. C.§§ 1531 to 1544. The ESA was enacted in 1973 and, with limited exceptions, has remained in its current form since then. The goal of the Act is to protect threatened and endangered species and the habitat on which they depend. 16 U.S.C.§ 1531(b). The Act's ultimate goal is to "recover" species so that they no longer need protection under the Act.

The ESA provides several mechanisms for accomplishing these goals. It authorizes the U.S. Fish and Wildlife Service (USFWS) to list "threatened" or "endangered" species, which are then protected under the Act, and to designate "critical habitat" for those species. The Act makes it unlawful for anyone to "take" a listed species unless an "incidental take" permit or statement is first obtained from the Department of the Interior. 16 U.S.C. §§ 1538, 1539. To "take" is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or to attempt to engage in any such conduct." 16 U.S.C. § 1532(19).

In addition, federal agencies must use their authority to conserve listed species. 16 U.S.C. § 1536(a)(1). They must make sure, in consultation with USFWS, that their actions do not jeopardize the continued existence of listed species or destroy or harm habitat that has been designated as critical for such species. 16 U.S.C. § 1536(a)(2). This requirement applies whenever a private or public entity undertakes an action that is "authorized, funded, or carried out," wholly or in part by a federal agency. *Id*. As part of the consultation process, federal agencies must usually prepare a biological assessment to identify endangered or threatened species and determine the likely effect of the federal action on those species and their critical habitat. 16 U.S.C. § 1536(c). At the end of the consultation process, the USFWS prepares a biological opinion stating whether the proposed action will jeopardize the species or destroy or adversely modify its critical habitat. 16 U.S.C. § 1536(c)(4). USFWS may also recommend reasonable alternatives that do not jeopardize the species. *Id*.

Some of the species in the planning region that are subject to protection under the ESA include:

- Jemez Mountains salamander (endangered): Los Alamos and Rio Arriba counties
- Southwestern willow flycatcher (endangered; final recovery plan): Los Alamos, Santa Fe, and Rio Arriba counties
- Yellow-billed cuckoo (threatened) : Los Alamos, Santa Fe, and Rio Arriba counties

- Mexican spotted owl (threatened; implementation of final recovery plan): Los Alamos, Santa Fe, and Rio Arriba counties
- Least tern (endangered; recovery plan): Rio Arriba County
- Meadow jumping mouse (endangered): Los Alamos and Rio Arriba counties

Of the threatened and endangered species found in the Jemez y Sangre region, the protection and recovery of the yellow-billed cuckoo, southwestern willow flycatcher, Jemez Mountains salamander, and New Mexico meadow jumping mouse are most likely to affect water planning within the region because all rely on riparian habitat. Any actions that are likely to harm the habitat used by these species will be subject to strict review and possible limitation.

4.2.1.2 New Mexico Wildlife Conservation Act

The New Mexico Wildlife Conservation Act, enacted in 1974, provides for the listing and protection of threatened and endangered wildlife species in the state. NMSA 1978, §§ 17-2-37 to 17-2-46. In enacting the law, the Legislature found that indigenous New Mexico species that are threatened or endangered "should be managed to maintain and, to the extent possible, enhance their numbers within the carrying capacity of the habitat." NMSA 1978, § 17-2-39(A).

The Act authorizes the New Mexico Department of Game and Fish to conduct investigations of indigenous New Mexico wildlife species suspected of being threatened or endangered to determine if they should be listed. NMSA 1978, § 17-2-40(A). Based on the investigation, the director then makes listing recommendations to the Game and Fish Commission. *Id*. The Act authorizes the Commission to issue regulations listing wildlife species as threatened or endangered based on the investigation and recommendations of the Department. NMSA 1978, § 17-2-41(A). Once a species is listed, the Department of Game and Fish, "to the extent practicable," is to develop a recovery plan for that species. NMSA 1978, § 17-2-40.1. The Act makes it illegal to "take, possess, transport, export, process, sell or offer for sale[,] or ship" any listed endangered wildlife species. NMSA 1978, § 17-2-41(C). However, enforcement of this provision of the Act is very limited.

Pursuant to the Act, the Commission has listed over 100 wildlife species—mammals, birds, fish, reptiles, amphibians, crustaceans, and mollusks—as endangered or threatened. 19.33.6.8 NMAC. As of August 2014, 62 species were listed as threatened, and 56 species were listed as endangered. *Id*. In the Jemez y Sangre planning region, all of the federally listed species discussed above are protected also under the New Mexico Wildlife Conservation Act.

4.2.2 Water Quality Laws

4.2.2.1 Federal Clean Water Act

The most significant federal law addressing water quality is the Clean Water Act (CWA), 33 U.S.C. §§ 1251 to 1387, which Congress enacted in its modern form in 1972, overriding President Nixon's veto. The stated objective of the CWA is to "restore and maintain the chemical, physical and biological integrity" of the waters of the United States. 33 U.S.C. § 1251(a).

4.2.2.1.1 NPDES Permit Program (Section 402)

The CWA makes it unlawful for any person to discharge any pollutant into waters of the United States without a permit. 33 U.S.C. § 1311(a). Generally, a "water of the United States" is a navigable water, a tributary to a navigable water, or an adjacent wetland, although the scope of the term has been the subject of considerable controversy as described below.

The heart of the CWA regulatory regime is the National Pollutant Discharge Elimination System (NPDES) permitting program under Section 402 of the Act. Any person—including a corporation, partnership, state, municipality, or other entity—that discharges a pollutant into waters of the United States from a point source must obtain an NPDES permit from EPA or a delegated state. 33 U.S.C. § 1342. A point source is defined as "any discernible, confined, and discrete conveyance," such as a pipe, ditch, or conduit. 33 U.S.C. § 1362(14). NPDES permits include conditions setting effluent limitations based on available technology and, if needed, effluent limitations based on water quality.

The CWA provides that each NPDES permit issued for a point source must impose effluent limitations based on application of the best practicable, and in some cases the best available, pollution control technology. 33 U.S.C. § 1311(b). The Act also requires more stringent effluent limitations for newly constructed point sources, called new source performance standards. 33 U.S.C. § 1316(b). EPA has promulgated technology-based effluent limitations for dozens of categories of new and existing industrial point source dischargers. 40 C.F.R. pts. 405-471. These regulations set limits on the amount of specific pollutants that a permittee may discharge from a point source.

The CWA requires the states to develop water quality standards for individual segments of surface waters. 33 U.S.C. § 1313. Water quality standards have three components. First, states must specify designated uses for each body of water, such as public recreation, wildlife habitat, water supply, fish propagation, or agriculture. 40 C.F.R. § 131.10. Second, they must establish water quality criteria for each body of water, which set a limit on the level of various pollutants that may be present without impairing the designated use of the water body. *Id.* § 131.11). And third, states must adopt an antidegradation policy designed to prevent the water body from becoming impaired such that it cannot sustain its designated use. *Id.* § 131.12).

Surface water segments that do not meet the water quality criteria for the designated uses must be listed as "impaired waters." 33 U.S.C. § 1313(d)(l)(C). For each impaired water segment, states must establish "total maximum daily loads" (TMDLs) for those pollutants causing the water to be impaired, allowing a margin of safety. 33 U.S.C. § 1313(d)(1). The states must submit to EPA for approval the list of impaired waters and associated TMDLs. 33 U.S.C. § 1313(d)(2). The TMDL process, in effect, establishes a basin-wide budget for pollutant influx to a surface water. The states must then develop a continuing planning process to attain the standards, including effluent limitations for individual point sources. 33 U.S.C. § 1313(e).

New Mexico has taken steps to implement these CWA requirements. As discussed in Section 4.2.2.3, the New Mexico Water Quality Control Commission has adopted water quality standards for surface waters. The standards include designated uses for specific bodies of water, water quality criteria, and an antidegradation policy. 20.6.4 NMAC. The New Mexico Environment Department (NMED) has prepared a report listing impaired surface waters throughout the state. *State of New Mexico Clean Water Act Section 303(d)/Section 305(b) Integrated Report – 2014-2016* (Nov. 18, 2014). In the Jemez y Sangre planning region, numerous segments of the Upper Rio Grande and Rio Grande in the Santa Fe reach are on the impaired list.

EPA can delegate the administration of the NPDES program to individual states. 33 U.S.C. § 1251(b). New Mexico is one of only a handful of states that has neither sought nor received delegation to administer the NPDES permit program. Accordingly, EPA administers the NPDES program in New Mexico.

4.2.2.1.2 Dredge and Fill Permit Program (Section 404)

The CWA establishes a second important permitting program under Section 404, regulating discharges of "dredged or fill material" into waters of the United States. 33 U.S.C. § 1344. Although the permit requirement applies to discharges of such material into all waters of the United States, most permits are issued for the filling of wetlands. The program is administered primarily by the Army Corps of Engineers, although EPA has the authority to veto permits and it shares enforcement authority with the Corps.

Like the Section 402 NPDES permit program, the CWA allows the Section 404 permit program to be delegated to states. 33 U.S.C. § 1344(g). Again, New Mexico has not received such delegation, and the program is implemented in New Mexico by the Corps and EPA.

4.2.2.1.3 Waters of the United States

The term "waters of the United States" delineates the scope of CWA jurisdiction, both for the Section 402 NPDES permit program, and for the Section 404 dredge and fill permit program. The term is not defined in the CWA, but is derived from the definition of "navigable waters," which means "waters of the United States including the territorial seas." 33 U.S.C. § 1362(7). In

1979, EPA promulgated regulations defining the term "waters of the United States." *See* 40 C.F.R. § 230.3(s) (2014)) (between 1979 and 2014, the term remained substantially the same). This definition, interpreted and implemented by both EPA and the Corps, remained settled for many years.

In 2001, however, the Supreme Court began to cast doubt on the validity of the definition as interpreted by EPA and the Corps. The Court took up a case in which the Corps had asserted CWA jurisdiction over an isolated wetland used by migratory birds, applying the Migratory Bird Rule. The Court ruled that the Corps had no jurisdiction under the CWA, emphasizing that the CWA refers to "navigable waters," and that the isolated wetland had no nexus to any navigable-in-fact water. *Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers,* 531 U.S.159 (2001).

The Court muddied the waters further in its 2006 decision in *Rapanos v. United States,* 547 U.S. 715 (2006) (consolidated with *Carabell v. U.S. Army Corps of Engineers*). Both these cases challenged the Corps' assertion of CWA jurisdiction over wetlands separated from traditional navigable waters by a man-made ditch. In a fractured 4-1-4 decision, the Court ruled that the Corps did not have CWA authority to regulate these wetlands. The plurality opinion, authored by Justice Scalia, held that CWA jurisdiction extends only to relatively permanent standing or flowing bodies of water that constitute rivers, streams, oceans, and lakes. *Id.* at 739. Nevertheless, jurisdiction extends to streams or lakes that occasionally dry up, and to streams that flow only seasonally. *Id.* at 732, n.3. And jurisdiction extends to wetlands with a continuous surface connection to such water bodies. *Id.* at 742. The concurring opinion, written by Justice Kennedy, stated that CWA jurisdiction extends to waters having a "significant nexus" to a navigable water, but the Corps had failed to show such nexus in either case. *Id.* at 779-80. In dissent, Justice Stevens would have found CWA jurisdiction in both cases. *Id.* at 787.

There has been considerable confusion over the proper application of these opinions. Based on this confusion, EPA and the Corps recently amended the regulatory definition of "waters of the United States" to conform to the *Northern Cook County* and *Rapanos* decisions. Final Rule, 80 Fed. Reg. 37054 (June 29, 2015) codified at 33 C.F.R. pt 328; 40 C.F.R. pts 110, 112, 116, 117, 122, 230, 232, 300, 302, and 401. The new definition covers (1) waters used for interstate or foreign commerce, (2) interstate waters, (3) the territorial seas, (4) impounded waters otherwise meeting the definition, (5) tributaries of the foregoing waters, (6) waters, including wetlands, adjacent to the foregoing waters, (7) certain specified wetlands having a significant nexus to the foregoing waters, and (8) waters in the 100-year floodplain of the foregoing waters. 40 C.F.R. § 302.3.

Several states and industry groups have challenged the new definition in federal district courts and courts of appeal. In one such challenge, the district court granted a preliminary injunction temporarily staying the rule. *North Dakota v. EPA*, 127 F. Supp. 3d 1047 (D.N.D. 2015).

Because the NMED and the NMOSE are plaintiffs in this case, the stay is effective—and the new definition does not now apply—in New Mexico. The United States has filed a motion asking the district court to dissolve the injunction and dismiss the case. This case is likely to be appealed.

4.2.2.2 Federal Safe Drinking Water Act

Enacted in 1974, the Safe Drinking Water Act (SDWA) regulates the provision of drinking water in the United States. 42 U.S.C. §§ 300f to 300j-26. The act's overriding purpose is "to insure the quality of publicly supplied water." *Arco Oil & Gas Co. v. EPA*, 14 F.3d 1431, 1436 (10th Cir. 1993). The SDWA requires EPA to promulgate national primary drinking water standards for protection of public health and national secondary drinking water standards for protection of public welfare. 42 U.S.C. § 300g-1. To provide this protection, the SDWA requires EPA, as part of the national primary drinking water regulations, to establish maximum contaminant level goals (MCLGs) and maximum contaminant levels (MCLs) for drinking water contaminants. 42 U.S.C. § 300g-1(b)(1). The regulations apply to all "public water systems." 42 U.S.C. § 300g.

EPA has promulgated primary and secondary drinking water regulations. 40 C.F.R. pts. 141, 143. Most significantly, the agency has set MCLGs and MCLs for a number of drinking water contaminants, including 16 inorganic chemicals, 53 organic chemicals, turbidity, 6 microorganisms, 7 disinfectants and disinfection byproducts, and 4 radionuclides. 40 C.F.R. §§ 141.11, 141.13, 141.61-66. As noted above, New Mexico has incorporated these primary and secondary regulations into the state regulations. 20.7.10.100 NMAC, 20.7.10.101 NMAC.

4.2.2.3 Federal Comprehensive Environmental Response, Compensation and Liability Act

Congress enacted the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), or the "Superfund" law, in 1980 to address the burgeoning problem of uncontrolled hazardous waste sites. 42 U.S.C. §§ 9601 to 9675. CERCLA authorizes EPA to prioritize hazardous waste sites according to the degree of threat they pose to human health and the environment, including surface water and groundwater. EPA places the most serious sites on the National Priorities List (NPL). 42 U.S.C. § 9605. Sites on the NPL are eligible for federal funds for long-term remediation, which most often includes groundwater remediation.

4.2.2.4 New Mexico Water Quality Act

The most important New Mexico law addressing water quality is the New Mexico Water Quality Act (WQA), NMSA 1978, §§ 74-6-1 to 74-6-17. The New Mexico Legislature enacted the WQA in 1967. The purpose of the WQA is "to abate and prevent water pollution." *Bokum Res. Corp. v. N.M. Water Quality Control Comm'n*, 93 N.M. 546, 555, 603 P.2d 285, 294 (1979).

The WQA created the Water Quality Control Commission to implement many of its provisions. NMSA 1978, § 74-6-3. The WQA authorizes the Commission to adopt state water quality

standards for surface and ground waters and to adopt regulations to prevent or abate water pollution. NMSA 1978, § 74-6-4(C) and (D). The WQA also authorizes the Commission to adopt regulations requiring persons to obtain from the NMED a permit for the discharge into groundwater of any water contaminant. NMSA 1978, § 74-6-5(A). The Department must deny a discharge permit if the discharge would cause or contribute to contaminant levels in excess of water quality standards "at any place of withdrawal of water for present or reasonably foreseeable future use." NMSA 1978, § 74-6-5(E)(3). The WQA also authorizes the Commission to adopt regulations relating to monitoring and sampling, record keeping, and Department notification regarding the permit. NMSA 1978, § 74-6-5(I). Permit terms are generally limited to five years. NMSA 1978, § 74-6-5(H).

Accordingly, the Commission has adopted ground water quality standards, regulations requiring discharge permits, and regulations requiring abatement of groundwater contamination. 20.6.2 NMAC. The water quality standards for ground water are published at Sections 20.6.2.3100 through 3114 NMAC, and the regulations for discharge permits are published at Sections 20.6.2.3101 to 3114 NMAC.

An important part of these regulations are those addressing abatement. 20.6.2.4101 - .4115 NMAC. The purpose of the abatement regulations is to "[a]bate pollution of subsurface water so that all groundwater of the State of New Mexico which has a background concentration of 10,000 milligrams per liter or less total dissolved solids is either remediated or protected for use as domestic or agricultural water supply." 20.6.2.4101.A(1) NMAC. The regulations require that groundwater pollution must be abated to conform to the water quality standards. 20.6.2.4103.B NMAC. Abatement must be conducted pursuant to an abatement plan approved by the Department, 20.6.2.4104.A NMAC, or pursuant to a discharge permit, 20.6.2.3109.E NMAC.

In addition, the Commission has adopted standards for surface water. 20.6.1 NMAC. The objective of these standards, consistent with the federal Clean Water Act (Section 4.2.2.1) is "to establish water quality standards that consist of the designated use or uses of surface waters of the [S]tate, the water quality criteria necessary to protect the use or uses[,] and an antidegradation policy." 20.6.4.6.A NMAC.. The standards include designated uses for specific bodies of water within the state, 20.6.4.50 to 20.6.4.806 NMAC; general water quality criteria, 20.6.4.13 NMAC; water quality criteria for specific designated uses, 20.6.4.900 NMAC; and water quality criteria for specific bodies of water, 20.6.4.50 to 20.6.4.806 NMAC. The standards also include an antidegradation policy, applicable to all surface waters of the state, to protect and maintain water quality. 20.6.4.8 NMAC. The antidegradation policy sets three levels of protection, closely matched to the federal regulations.

Lastly, the Commission has also adopted regulations limiting the discharge of pollutants into surface waters. 20.6.2.2100 to 2202 NMAC.

4.2.2.5 New Mexico Drinking Water Standards

The New Mexico Environmental Improvement Act created an Environmental Improvement Board, and it authorizes the Board to promulgate rules and standards for water supply. NMSA 1978, § 74-1-8(A)(2). The Board has accordingly adopted state drinking water standards for all public water systems. 20.7.10 NMAC. The state regulations incorporate by reference the federal primary and secondary drinking water standards, 40 C.F.R. parts 141 and 143, established by the EPA under the Safe Drinking Water Act (Section 4.2.2.2). 20.7.10.100 NMAC, 20.7.10.101 NMAC.

4.2.2.6 Tribal Law

A number of the Pueblos in the region (Nambe, Ohkay Owingeh, Pojoaque, Santa Clara, and Tesuque) have adopted water quality standards and monitor water quality on a regular basis.

- The Pueblo of Nambe's Department of Environmental and Natural Resources manages the Pueblo's Water Quality Program. Its goals are to determine and maintain water quality to protect human health, tribal lifestyles, and ecosystem health.
- The Pueblo of San Ildefonso has designated uses for each of its water resources separately. Each month, the Pueblo monitors physiochemical parameters in 14 water bodies using defined parameters described in NMAC 20.6.4.
- As part of its Water Quality Standards, Santa Clara Pueblo enforces controls on the discharge of pollutants to tribal waters, with assistance from the EPA.

4.3 Legal Issues Unique to the Region and Local Conflicts Needing Resolution

Ongoing litigation that may affect water management in the Jemez y Sangre region includes litigation related to objections to the Aamodt Settlement Agreement. Further, the Top of the World water rights transfer, which is an effort by Santa Fe County to transfer water rights located in Taos County downstream to meet water requirements of the Aamodt Settlement, has been protested and will be the subject of administrative and, potentially, judicial proceedings. The progress of the *Anaya* adjudication will also be important to water planning in the region.

Other key issues including conflicts in the region identified by the region are summarized in Section 5.

5. Water Supply

This section provides an overview of the water supply in the Jemez y Sangre Water Planning Region, including climate conditions (Section 5.1), surface water and groundwater resources (Sections 5.2 and 5.3), water quality (Section 5.4), and the administrative water supply used for planning purposes in this regional water plan update (Section 5.5). Additional quantitative

assessment of water supplies is included in Section 7, Identified Gaps between Supply and Demand.

The Handbook specifies that each of the 16 regional water plans briefly summarize water supply information from the previously accepted plan and provide key new or revised information that has become available since submittal of the accepted regional water plan. The information in this section regarding surface and groundwater supply and water quality is thus drawn largely from the accepted 2003 *Jemez y Sangre Regional Water Plan* (DBS&A and Lewis, 2003) and the RWP updates (JySWPC, 2007; DBS&A and Lewis, 2009) and where appropriate, updated with more recent information and data from a number of sources, as referenced throughout this section.

Currently some of the key water supply updates and issues impacting the Jemez y Sangre region are:

- Historically insufficient surface water supply, projected decreases in surface water supply, and earlier runoff due to climate change will add additional stresses to both agricultural water users and public water suppliers.

- San Juan-Chama Project water, once thought to have a "firm yield" of 96,200 acre-feet per year experienced shortages in 2014 and 2015, revealing the uncertainty of this surface water. Allocations in 2014 and 2015 were 88.9 and 92.8 percent of full allotments, respectively, due to a series of dry years (USBR, 2016).

- The Buckman Direct Diversion of San Juan-Chama Project water from the Rio Grande in 2011 helped expand the community of Santa Fe's conjunctive-use portfolio, but the system, which is vulnerable to contamination from Los Alamos and high sediment loads, has sustained some temporary operational difficulties. Los Alamos County, the City of Española, and Ohkay Owingeh are also exploring options for direct or indirect diversions of San Juan-Chama Project water.

- Groundwater resources are diminishing in some areas. An updated administrative groundwater model is needed to better manage the aquifers.

- The discharge of spring flow in the La Cienega area (which is the source of irrigation water) has declined over the past four decades due to groundwater pumping east of the springs. The long-term declining groundwater levels are a key indicator of human-caused groundwater depletions from wells upgradient in the Eldorado buried valley (Johnson et al., 2015).

- Projected increases in water demand due to growing population and increased temperatures (which increase the consumptive irrigation requirement of crops and landscaping) are adding stress to the resources.

- Tension between urban and agricultural water use remains a key water supply issue in the region. Often, the only new source of water supply for urban uses is derived from transfers from agricultural water use (through direct diversion or for offsetting impacts of groundwater pumping), which may or may not be in the best interest of the community as a whole. Mechanisms to protect agriculture as part of the community while allowing some temporary water transfers to urban use need to be developed. Mechanisms could include contractual arrangements that allow a municipality to utilize agricultural water for offsets in particular years. The various options were examined in detail in the 2003 planning effort during a workshop on Area of Origin (DBS&A and Lewis, 2003, Appendix C) and in white papers exploring strategies for meeting future water demand (DBS&A and Lewis, 2003, Appendix F, White Papers: Bank Water).

- Impacts following forest fires including debris flows and high peak flows, loss of storage capacity in reservoirs, and water quality impacts, are addressed through forest restoration activities, which remain a high priority for this region. Forest restoration also needs to occur upstream in Colorado to protect the native flows in the Rio Grande and San Juan-Chama water, but this area is outside the jurisdiction of New Mexico.

- More intense precipitation events predicted with climate change require improving the landscape and its resiliency in sustaining peak flow events. Unfortunately, the recently released Federal Emergency Management Administration floodplain maps of Rio Arriba, Los Alamos, and Santa Fe counties (FEMA, 2010, 2012a, 2012b) do not consider predicted increases in extreme precipitation.

- The State of New Mexico, the United States, the City of Santa Fe, Santa Fe County, and the Pueblos of Nambe, Pojoaque, San Ildefonso, and Tesuque have entered into a settlement agreement that determines the water rights of the four pueblos in the Aamodt Adjudication. The settlement agreement specifies plans to supply pueblo and non-pueblo uses by bringing water to the Pojoaque Valley area through a regional water system that will be operated by Santa Fe County. An initial settlement agreement was signed in February 2006, and following the passage of the Aamodt Litigation Settlement Act on December 8, 2010 (Pub. L. No. 111-291, 124 Stat. 3064, 3134-3156), a final Settlement Agreement (conformed to include provisions of the Act) was signed by all parties, including the United States in its trust capacity, in March 2013 (NMOSE, 2015).

- An environmental impact statement (EIS) is currently being prepared for the implementation of the regional water system in the Pojoaque Valley. Rio Grande water for the regional system would be diverted at San Ildefonso Pueblo, through either a surface water intake or horizontal collector wells, and then treated (USBR, 2015).

- Hexavalent chromium has been detected in the regional aquifer in the Los Alamos area. The source is thought to be historical discharges from LANL cooling towers where

potassium dichromate was used as a descaler. The Los Alamos County water supply is not presently impacted by the hexavalent chromium, but ongoing monitoring and remediation efforts will continue.

- In addition to the chromium, other constituents resulting from prior LANL activities are regularly monitored and reported. A summary of information regarding the monitoring is provided in LANL annual environmental reports (e.g., LANL, 2014).

- Many small rural drinking water systems within the region (Section 6.4) are challenged by the requirements for maintenance, upgrades, training, operation, and monitoring to ensure delivery of water that meets drinking water quality standards.

- In addition to the small drinking water systems in the region, there are many small acequia systems that also face challenges in obtaining financing for maintaining their infrastructure.

- The Rio Grande is the main river in the planning region and is fully appropriated. Much of the groundwater in the region is within the Rio Grande UWB and is considered to be stream-connected; therefore, any new diversion of surface water or stream-connected groundwater requires the transfer of a valid water right (aside from small

Rio Grande Compact

Signed in 1938 between Colorado, New Mexico, and Texas, and approved by Congress in 1939, the Rio Grande Compact apportions the surface waters of the Rio Grande Basin above Ft. Quitman, Texas, among the three states. The Rio Grande Compact establishes, among other things, annual water delivery obligations and depletion entitlements for Colorado and New Mexico. The Compact is administered by a commission consisting of one representative from each state and one from the federal government.

The Compact provides for debits and credits to be carried over and accrued from year to year until extinguished under provisions of the Compact. Annual Compact accounting, based on flows at index gaging stations and changes in reservoir storage determines Colorado's and New Mexico's delivery obligations each year.

The Compact affects water planning in New Mexico in several ways:

- The Compact established limitations on the amount of water available for depletion in the northern portion of the Basin in New Mexico. It also requires that a portion of the water that enters the Middle Rio Grande valley be delivered to Elephant Butte Reservoir. These requirements limit depletions in the Rio Chama, Taos, Jemez y Sangre, Middle Rio Grande, and Socorro-Sierra planning regions.
- When the stored water in Elephant Butte drops below specified levels, certain provisions of the Compact restrict storage in reservoirs upstream of Elephant Butte constructed after 1929, thus impacting water operations in the region. Additionally, should New Mexico end the year with an accrued debit balance, it is required to retain in storage an amount of water equivalent to that total debit.

In 1938, in *Hinderlider v La Plata River and Cherry Creek Ditch Co*., the U.S. Supreme Court ruled that compliance with the terms of an interstate stream compact have the highest priority within a stream system. Thus, from a regional water planning perspective, the waters of the Rio Grande Basin above Elephant Butte Reservoir are a singular supply shared among the Rio Chama, Taos, Jemez y Sangre, Middle Rio Grande, and Socorro-Sierra planning regions, the use of which is constrained by the terms of the Compact.

individual diversions from new domestic or livestock wells) and the transfer is limited to the consumptive use portion of that right. The availability of water rights may thus be a limiting factor in meeting the future water needs of the region.

- The Rio Grande Compact mandates delivery of specified amounts of water to Elephant Butte Reservoir, limiting the amount of water that can be diverted and consumed between the Otowi Gage in the Jemez y Sangre region and Elephant Butte Reservoir. Certain provisions of the Compact restrict storage in reservoirs constructed after 1929 when the Rio Grande Project water in Elephant Butte drops below certain levels.

- The congressionally authorized Middle Rio Grande Endangered Species Collaborative Program (MRGESCP) has allowed the coordination of efforts by federal, state, and local government, and Native American and private entities. The MRGESCP continues efforts to improve the status of the Rio Grande silvery minnow while assuring that other water uses are able to continue. At the same time, it continues to support the U.S. Bureau of Reclamation (USBR), Middle Rio Grande Conservancy District, and State of New Mexico in entering into an agreement (biological opinion) with the USFWS for Rio Grande reservoir and river operations that include the effects of all the water uses described in this plan. If successful, Endangered Species Act compliance protections will remain in place for the region's Rio Grande Basin users.

5.1 Summary of Climate Conditions

The accepted regional water plan (DBS&A and Lewis, 2003) and the 2009 update (DBS&A and Lewis, 2009) included analyses of historical temperature and precipitation in the region. This section provides an updated summary of temperature, precipitation, snowpack conditions, and drought indices pertinent to the region (Section 5.1.1). Studies relevant to climate change and its potential impacts to water resources in New Mexico and the Jemez y Sangre region are discussed in Section 5.1.2.

5.1.1 Temperature, Precipitation, and Drought Indices

Table 5-1 lists the periods of record for weather stations in Rio Arriba, Los Alamos, and Santa Fe counties and identifies two stations that were used for detailed analysis of weather trends. These stations were selected based on location, how well they represented conditions in the region, and completeness of their historical records. In addition to the climate stations, data were available from four snow course or snowpack telemetry (SNOTEL) stations and were used to document snowfall in the Sangre de Cristo Mountains (Table 5-1). The locations of the climate stations for which additional data were analyzed are shown in Figure 5-1.

Long-term minimum, maximum, and average temperatures for the two representative climate stations are detailed in Table 5-2, and average summer and winter temperatures for each year are shown on Figure 5-2.

Table 5-1. Jemez y Sangre Climate Stations

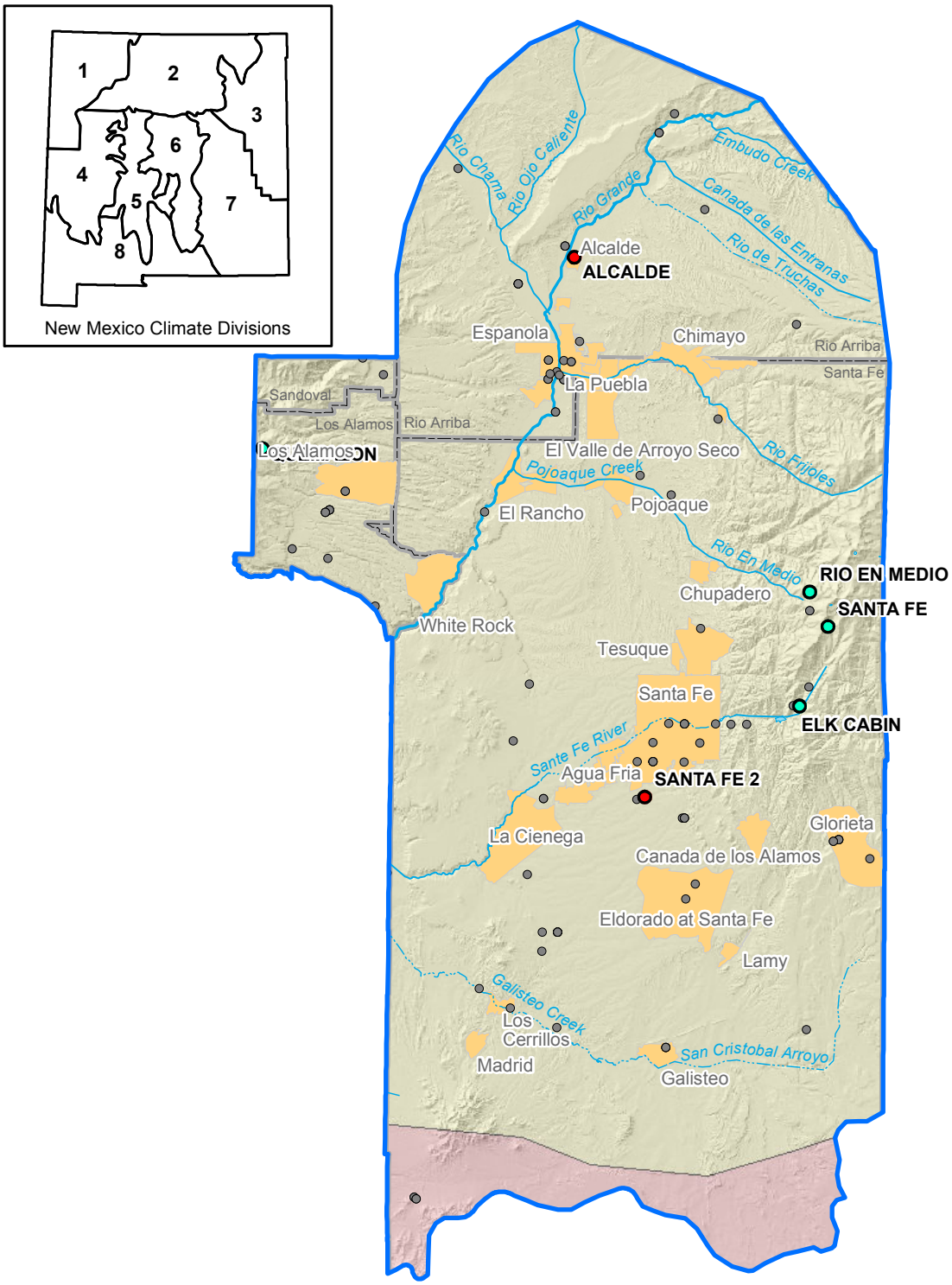
Climate Stations [a]	Latitude	Longitude	Elevation	Precipitation		Temperature	
				Data Start	Data End	Data Start	Data End
Rio Arriba County							
Alcalde	36.09	–106.06	5,680	4/1/1953	Present	4/1/1953	Present
Truchas	36.03	–105.82	8,035	4/1/1909	5/31/1962	5/1/1909	5/31/1962
Los Alamos County							
Bandelier Natl Monument	35.78	–106.27	6,063	5/1/1924	8/31/1976	1/1/1937	6/30/1976
Los Alamos	35.86	–106.32	7,424	1/1/1902	Present	7/1/1918	Present
Santa Fe County							
Cundiyo	35.95	–105.90	6,889	4/1/1909	9/30/1923	—	—
Espanola	36.00	–106.06	5,620	4/1/1895	9/30/2012	4/1/1895	8/31/2012
Glorieta	35.58	–105.77	7,520	3/1/1915	7/31/2010	—	—
Golden	35.27	–106.21	6,700	5/1/1901	Present	7/1/1947	12/31/1947
Nambe 1	35.90	–105.98	6,053	2/1/1893	9/30/1974	2/1/1930	10/31/1931
Santa Fe	35.68	–105.90	7,205	9/1/1849	3/31/1972	1/1/1874	3/31/1972
Santa Fe 2	35.62	–105.98	6,756	4/1/1972	Present	4/1/1972	Present
Santa Fe CAA Airport	35.62	–106.08	6,348	6/1/1941	Present	6/1/1941	Present
Turquoise	35.50	–106.07	6,204	6/1/1953	2/28/1996	4/1/1964	2/28/1996
Sandoval County							
Santa Clara Ranger Stn	36.00	–106.28	7,405	8/1/1937	2/28/1948	8/1/1937	2/28/1948
SNOTEL Stations							
Quemazon – SNTL	35.92	–106.39	9,500	6/4/1980	Present	NR	NR
Elk Cabin – Snow	35.70	–105.81	8,250	1948	Present	NR	NR
Elk Cabin – SNTL	35.70	–105.81	8,210	10/1/1996	Present	NR	NR
Rio En Medio – Snow	35.80	–105.80	10,300	1950	Present	NR	NR
Santa Fe – SNTL	35.77	–105.78	11,445	10/1/1996	Present	NR	NR

Source: WRCC, 2014

[a] Stations in **bold** type were selected for detailed analysis.

— = Information not available

NR = Temperature is not recorded at SNOTEL stations.



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Climate Stations

Figure 5-1

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Table 5-2. Temperature and Precipitation for Selected Climate Stations Jemez y Sangre Water Planning Region

Station Name	Precipitation (inches)				Temperature			
	Average Annual [a]	Minimum [b]	Maximum [b]	% of Possible Observations [c]	Average (°F)			% of Possible Observations [c]
					Annual [d]	Minimum [e]	Maximum [e]	
Alcalde	10.01	2.66	16.16	95.9	51.0	34.0	68.1	96.8
Santa Fe 2	13.68	7.23	20.09	98.9	50.4	36.0	64.9	98.7

Source: Statistics computed by Western Regional Climate Center (2014)

ft amsl = Feet above mean sea level

°F = Degrees Fahrenheit

[a] Average of annual precipitation totals for the period of record at each station.

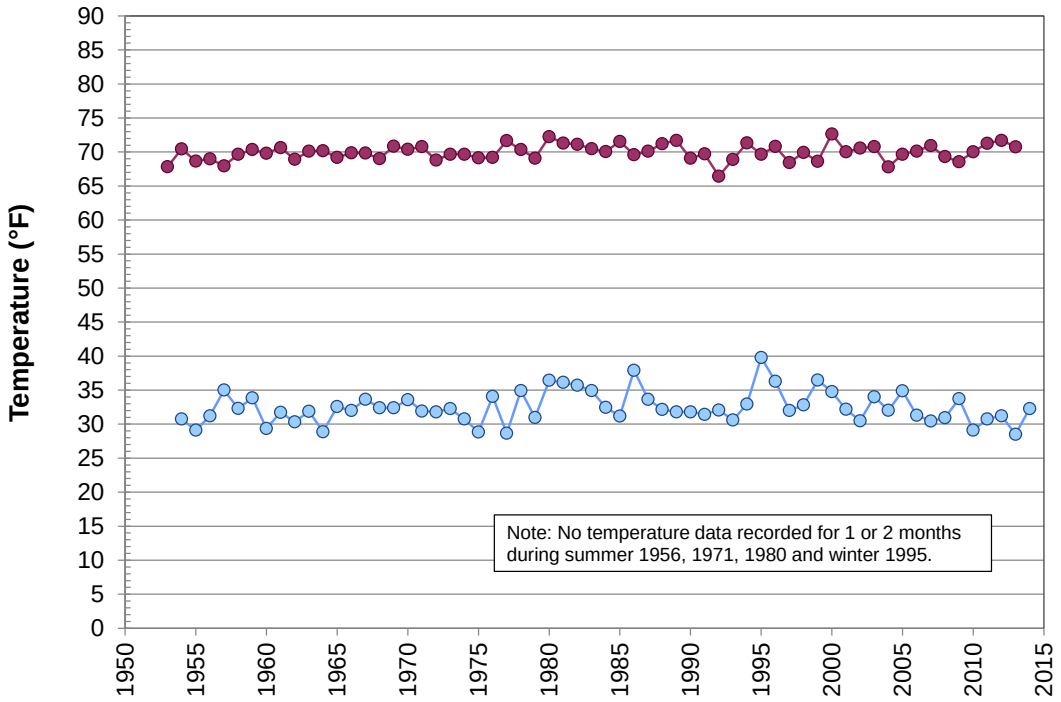
[b] Minimum and maximum recorded annual precipitation amounts for each station.

[c] Amount of completeness in the daily data set that was recorded at each station (e.g., 99% complete means there is a 1% data gap).

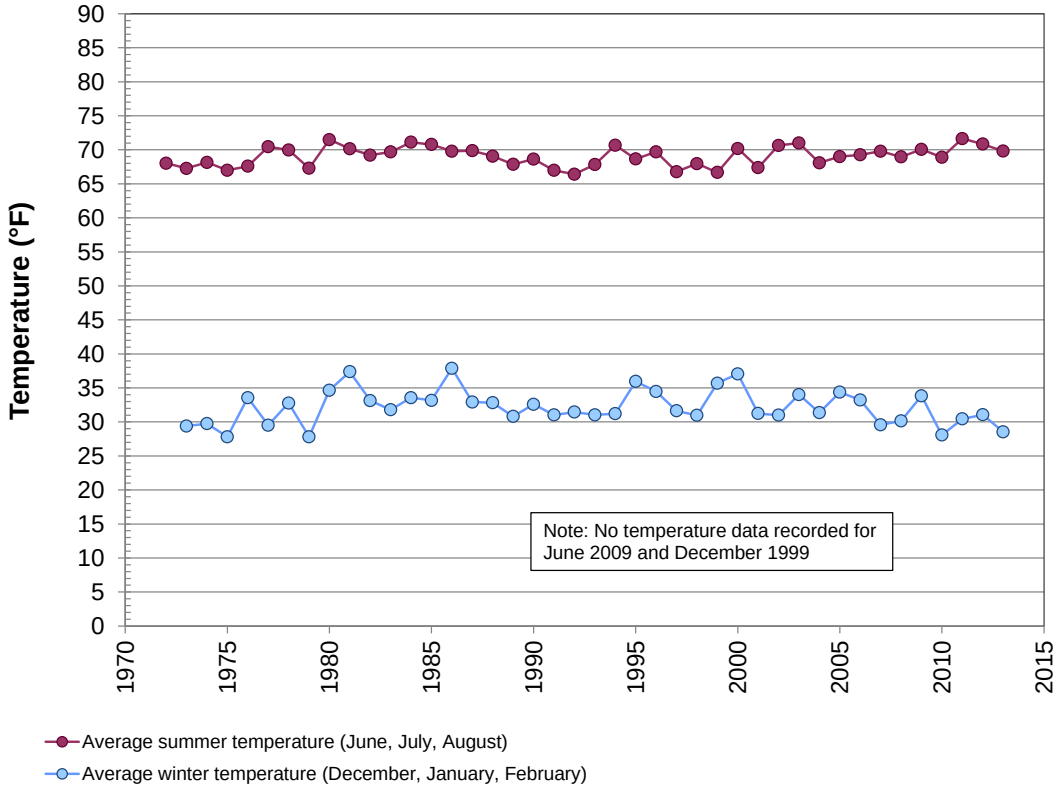
[d] Average of the daily average temperatures calculated for each station.

[e] Average of the daily minimum (or maximum) temperature recorded daily for each station.

Alcalde



Santa Fe 2



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Average Temperature
Alcade and Santa Fe 2 Climate Stations

Figure 5-2

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The average precipitation distribution across the entire region is shown on Figure 5-3, and Table 5-2 lists the minimum, maximum, and long-term average annual precipitation at the two representative stations in the planning region. Total annual precipitation for the selected climate stations is shown in Figure 5-4.

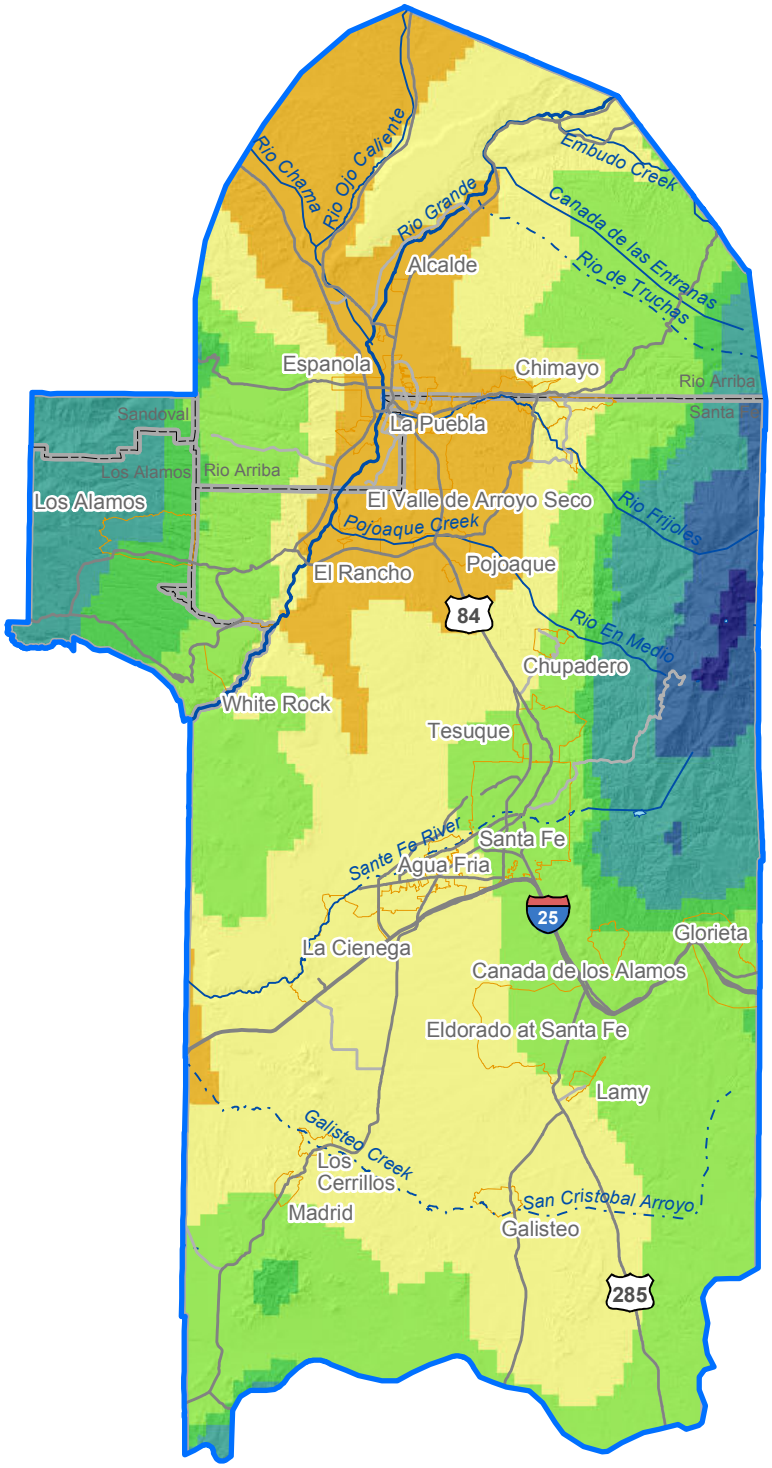
The Natural Resources Conservation Service (NRCS) operates four SNOTEL and/or snow course stations in the planning region: Quemazon, Elk Cabin, Rio en Medio, and Santa Fe. All four stations provide snow depth and snow water equivalent data (Figure 5-5) (NRCS, 2014a). The snow water equivalent is the amount of water, reported in inches, within the snowpack, or the amount of water that would result if the snowpack were instantly melted (NRCS, 2014b). The end of season snowpack is a good indicator of the runoff that will be available to meet water supply needs. A summary of the early April (generally measured within a week of April 1) snow depth and snow water equivalent information at the four stations is provided on Figure 5-5.

Another way to review long-term variations in climate conditions is through drought indices. A drought index consists of a ranking system derived from the assimilation of data—including rainfall, snowpack, streamflow, and other water supply indicators—for a given region. The Palmer Drought Severity Index (PDSI) was created by W.C. Palmer (1965) to measure the variations in the moisture supply and is calculated using precipitation and temperature data as well as the available water content of the soil. Because it provides a standard measure that allows comparisons among different locations and months, the index is widely used to assess the weather during any time period relative to historical conditions. The PDSI classifications for dry to wet periods are provided in Table 5-3.

There are considerable limitations when using the PDSI, as it may not describe rainfall and runoff that varies from location to location within a climate division and may also lag in indicating emerging droughts by several months. Also, the PDSI does not consider groundwater or reservoir storage, which can affect the availability of water supplies during drought conditions. However, even with its limitations, many states incorporate the PDSI into their drought monitoring systems, and it provides a good indication of long-term relative variations in drought conditions, as PDSI records are available for more than 100 years.

The PDSI is calculated for climate divisions throughout the United States. Most of the Jemez y Sangre region falls within New Mexico Climate Division 2 (the Northern Mountains Climate Division); a relatively small portion of Santa Fe County in the region falls within Division 6 (the Central Highlands Climate Division) (Figure 5-1). Figure 5-6 shows the long-term PDSI for these two regions. Of interest are the large variations from year to year in both divisions, which are similar in pattern though not necessarily in magnitude.

Source: PRISM, 2012



N

0 5 10 Miles

Explanation

- Stream (dashed where intermittent)
- Lake
- City
- County
- Water planning region

Normal annual precipitation (in/yr)

- 10 - 12
- 12 - 14
- 14 - 18
- 18 - 20
- 20 - 30
- 30 - 40
- 40 - 43

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Average Annual Precipitation (1980 to 2010)

Figure 5-3

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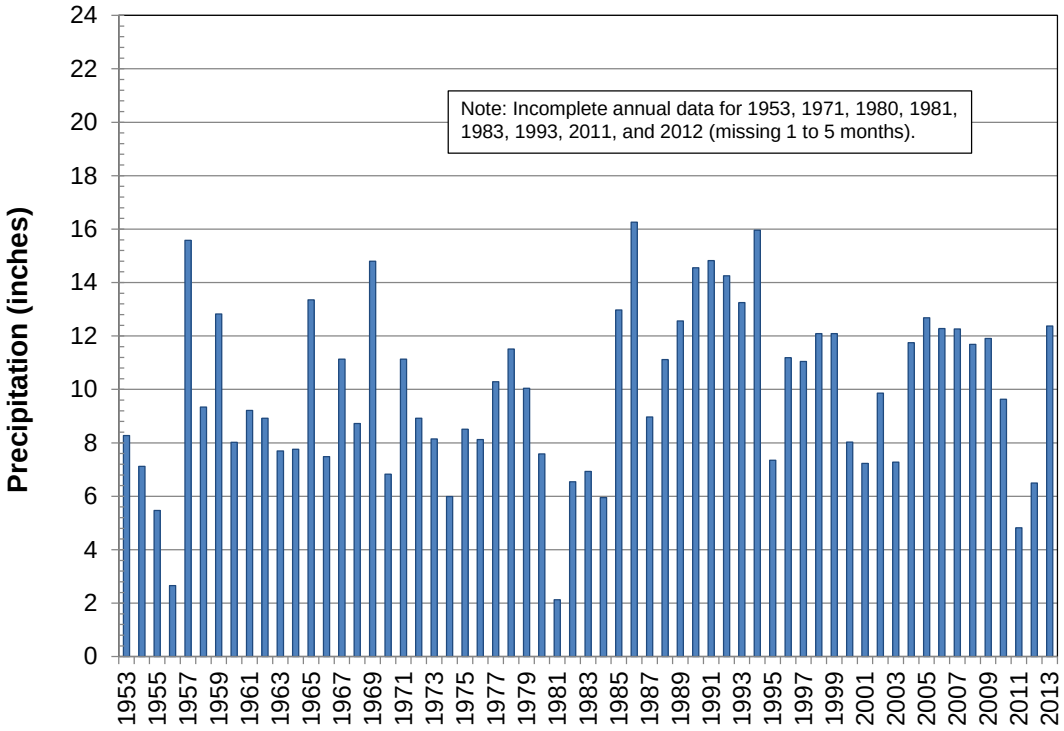
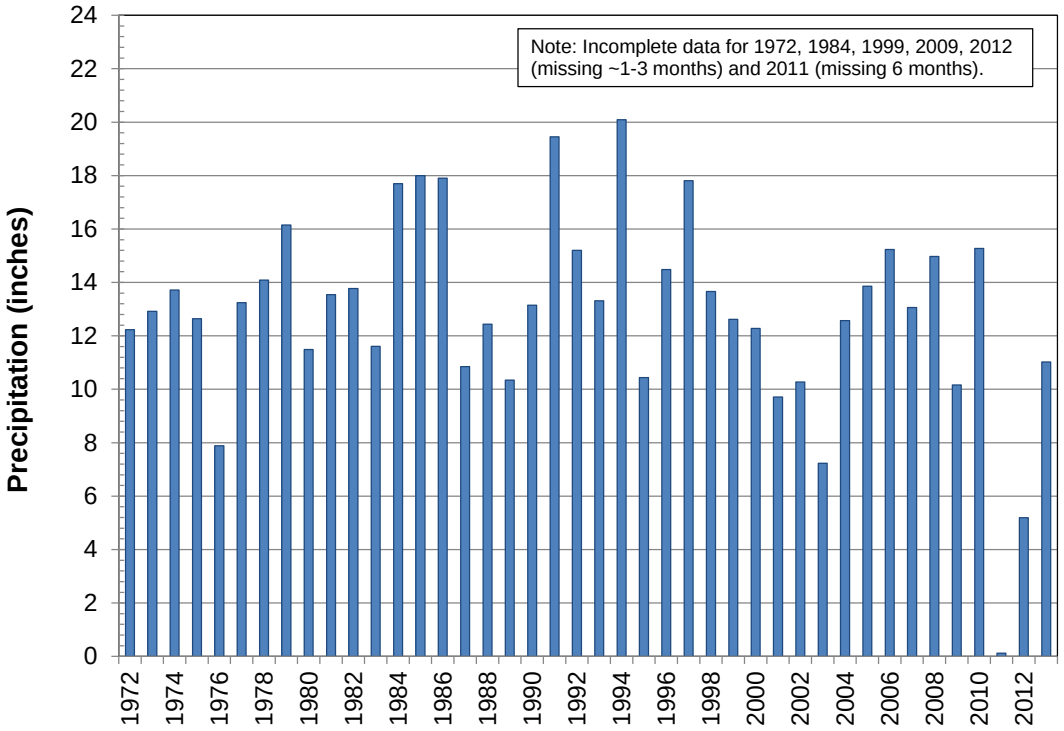
Alcalde



Santa Fe 2



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Annual Precipitation
Alcade and Santa Fe 2 Climate Stations

Figure 5-4

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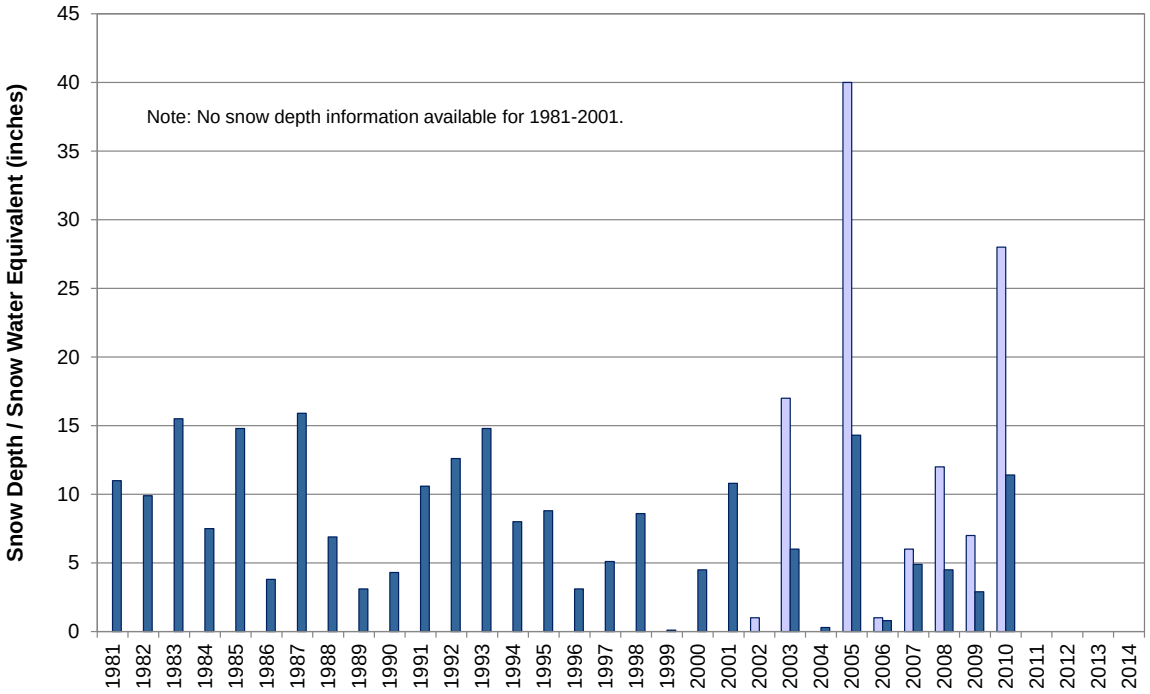
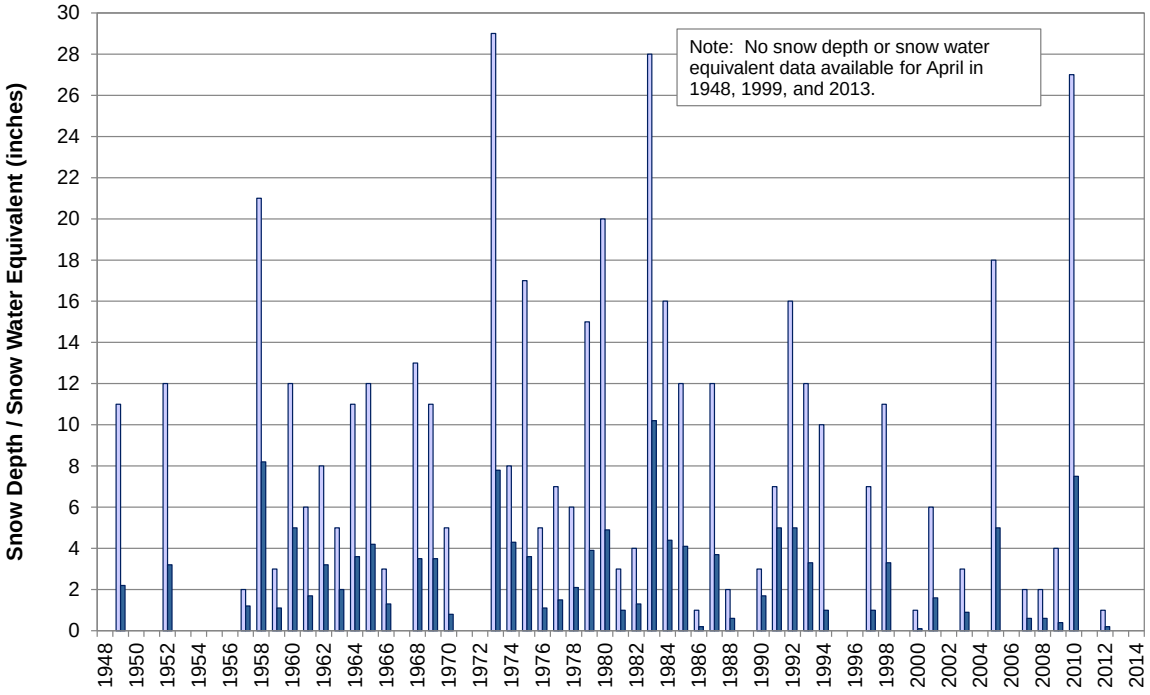
Quemazon SNOTEL



Elk Cabin Snow Course and Aerial Marker



Snow depth

Snow water equivalent (the amount of water that would result if the snowpack were instantly melted)

Notes: 1. Measurements made in the last few days of March or first few days of April.
2. Years with no bars visible are years with zero snow depth (unless otherwise noted).

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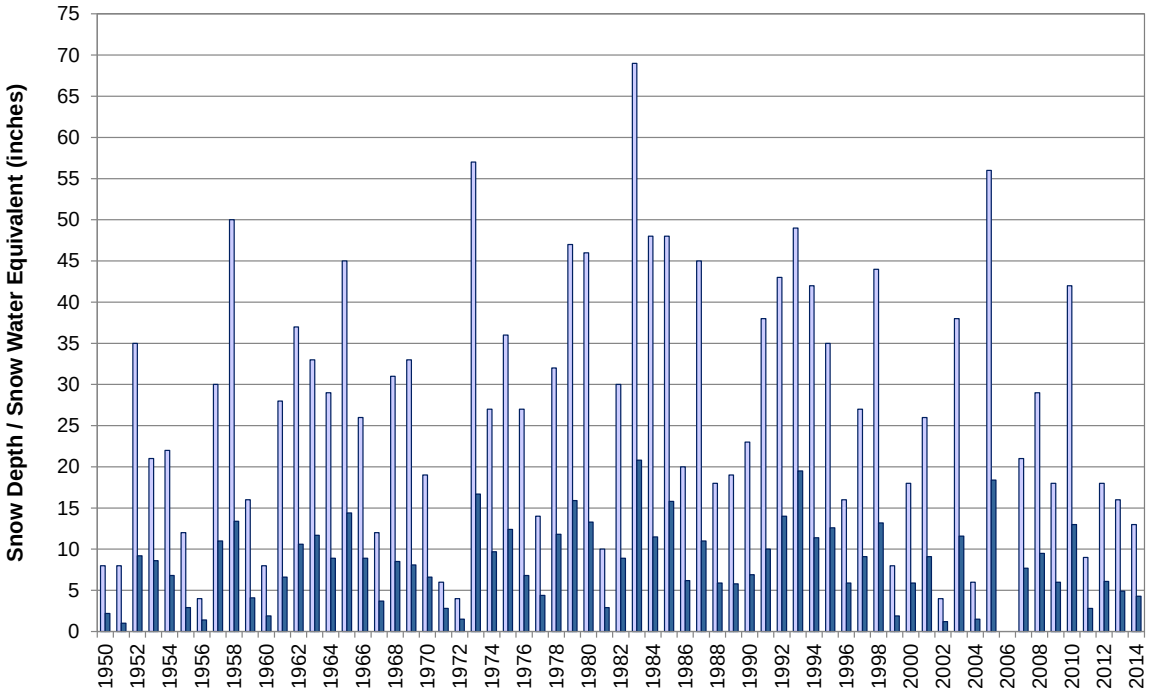
Snow Depth and Snow Water Equivalent for April

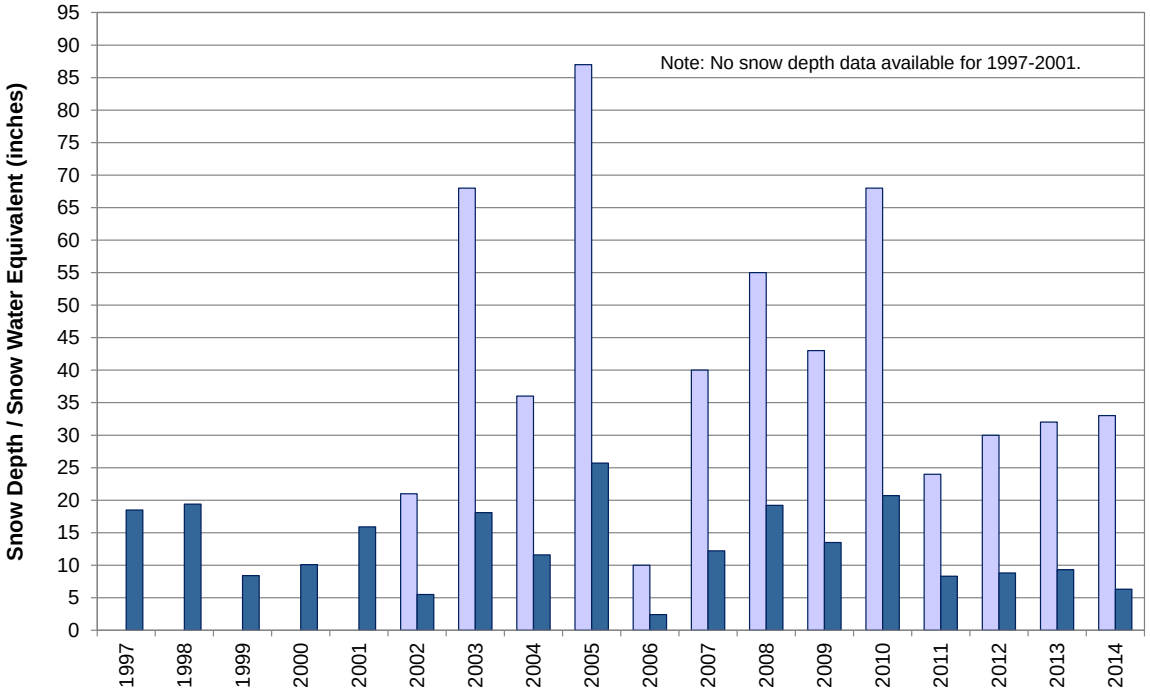
Figure 5-5a

P:_WR12-165\RWPs_2014\3_Jemez y Sangre\Fig5-05a_Reg 3_Snow_Quemazon-Elk Cabin.docx 6/29/16

Rio en Medio Snow Course with Aerial Marker



Santa Fe SNOTEL



Snow depth

Snow water equivalent (the amount of water that would result if the snowpack were instantly melted)

Notes: 1. Measurements made in the last few days of March or first few days of April.
2. Years with no bars visible are years with zero snow depth (unless otherwise noted).

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Snow Depth and Snow Water Equivalent for April

Figure 5-5b

P:_WR12-165\RWPs_2014\3_Jemez y Sangre\Fig5-05a_Reg 3_Snow_Quemazon-Elk Cabin.docx 6/29/16

Table 5-3. Palmer Drought Severity Index Classifications

PDSI Classification	Description
+ 4.00 or more	Extremely wet
+3.00 to +3.99	Very wet
+2.00 to +2.99	Moderately wet
+1.00 to +1.99	Slightly wet
+0.50 to +0.99	Incipient wet spell
+0.49 to –0.49	Near normal
–0.50 to –0.99	Incipient dry spell
–1.00 to –1.99	Mild drought
–2.00 to –2.99	Moderate drought
–3.00 to –3.99	Severe drought
–4.00 or less	Extreme drought

The chronological history of drought, as illustrated by the PDSI, indicates that the most severe droughts in the last century occurred in the early 1900s, the 1950s, the early 2000s, and in recent years (2011 to 2013) (Figure 5-6).

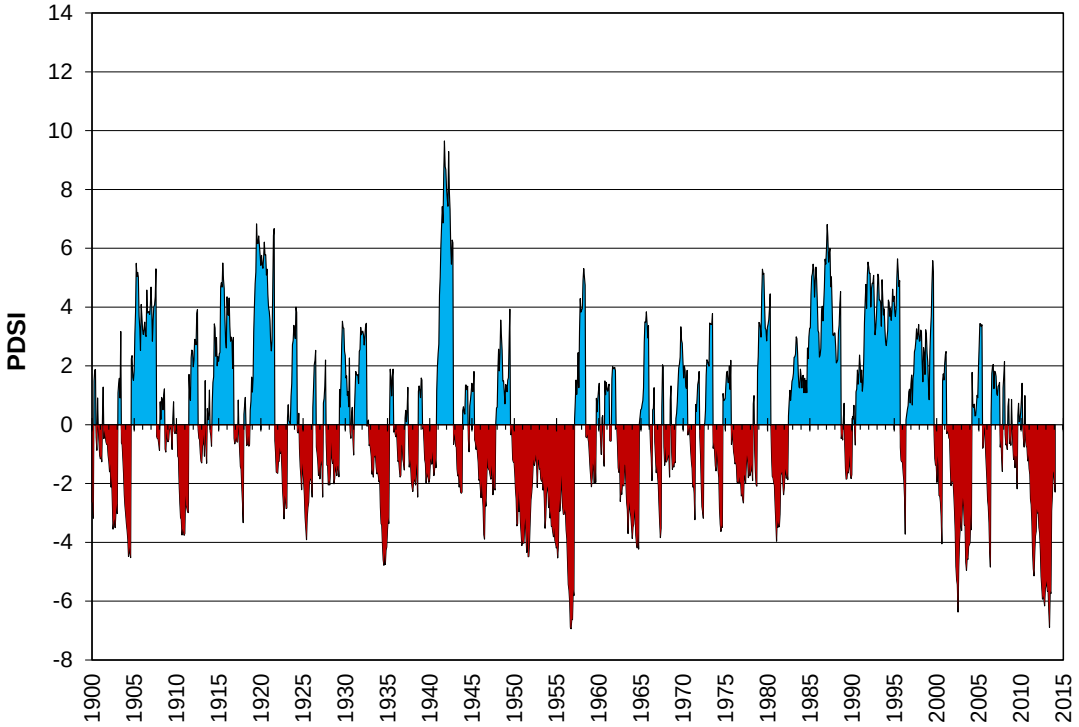
The likelihood of drought conditions developing in New Mexico is influenced by several weather patterns:

- *El Niño/La Niña:* El Niño and La Niña are characterized by a periodic warming and cooling, respectively, of sea surface temperatures across the central and east-central equatorial Pacific. Years in which El Niño is present are more likely to be wetter than average in New Mexico, and years with La Niña conditions are more likely to be drier than average, particularly during the cool seasons of winter and spring.

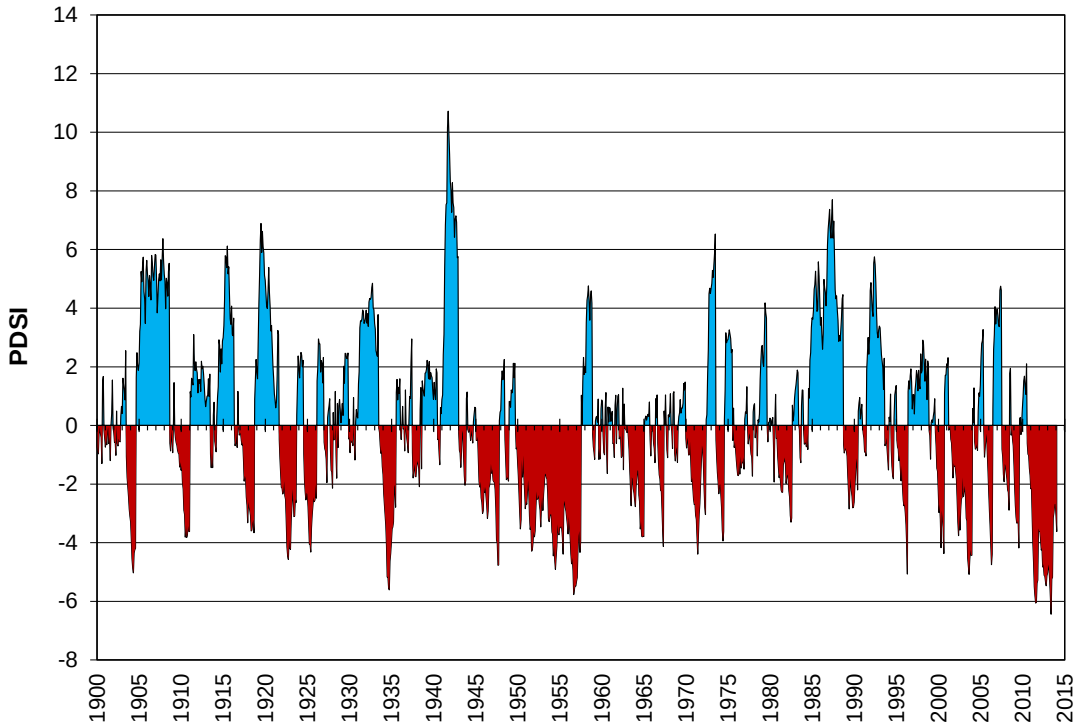
- *The Pacific Decadal Oscillation (PDO):* The PDO is a multi-decadal pattern of climate variability caused by shifting sea surface temperatures between the eastern and western Pacific Ocean that cycle approximately every 20 to 30 years. Warm phases of the PDO (shown as positive numbers on the PDO index) correspond to El Niño-like temperature and precipitation anomalies (i.e., wetter than average), while cool phases of the PDO (shown as negative numbers on the PDO index) correspond to La Niña-like climate patterns (drier than average). It is believed that since 1999 the planning region has been in the cool phase of the PDO.

- *The Atlantic Multidecadal Oscillation (AMO):* The AMO refers to variations in surface temperatures of the Atlantic Ocean which, similarly to the PDO, cycle on a multi-decade frequency. The pairing of a cool phase of the PDO with the warm phase of the AMO is typical of drought in the southwestern United States (McCabe et al., 2004; Stewart, 2009). The AMO has been in a warm phase since 1995. It is possible that the AMO may be shifting to a cool phase but the data are not yet conclusive.

Climate Division 2



Climate Division 6



Note: Blue indicates wetter than average conditions and red indicates drier than average conditions, as described on Table 5-3.

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Palmer Drought Severity Index
New Mexico Climate Divisions 2 and 6

Figure 5-6

P:_WR12-165\RWPs_2015-2016\3_Jemez y Sangre\Fig5-06_Reg 3_PDSI Div 2&6.docx 6/29/16

- *The North American Monsoon* is characterized by a shift in wind patterns in summer, which occurs as Mexico and the southwest U.S. warm under intense solar heating. As this happens, the flow reverses from dryland areas to moist ocean areas. Low-level moisture is transported into the region primarily from the Gulf of California and eastern Pacific. Upper-level moisture is transported into the region from the Gulf of Mexico by easterly winds aloft. Once the forests of the Sierra Madre Occidental green up from the initial monsoon rains, evaporation and plant transpiration can add additional moisture to the atmosphere that will then flow into the region. If the Southern Plains of the U.S. are unusually wet and green during the early summer months, that area can also serve as a moisture source. This combination causes a distinct rainy season over large portions of western North America (NWS, 2015).

5.1.2 Recent Climate Studies

New Mexico's climate has historically exhibited a high range of variability. Periods of extended drought, interspersed with relatively short-term, wetter periods, are common. Historical periods of high temperature and low precipitation have resulted in high demands for irrigation water and higher open water evaporation and riparian evapotranspiration. In addition to natural climatic cycles (i.e., El Niño/La Niña, PDO, AMO [Section 5.1.1]) that affect precipitation patterns in the southwestern United States, there has been considerable recent research on potential climate change scenarios and their impact on the Southwest and New Mexico in particular.

The consensus on global climate conditions is represented internationally by the work of the Intergovernmental Panel on Climate Change (IPCC), whose Fifth Assessment Report, released in September 2013, states, "Warming of the climate system is unequivocal, and since the 1950s many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased" (IPCC, 2013). Atmospheric concentrations of greenhouse gases are rising so quickly that all current climate models project significant warming trends over continental areas in the 21st century.

In the United States, regional assessments conducted by the U.S. Global Change Research Program (USGCRP) have found that temperatures in the southwestern United States have increased and are predicted to continue to increase, and serious water supply challenges are expected. Water supplies are projected to become increasingly scarce, calling for trade-offs among competing uses and potentially leading to conflict (USGCRP, 2009). Most of the major river systems in the southwestern U.S. are expected to experience reductions in streamflow and other limitations to water availability (Garfin et al., 2013).

Although there is consensus among climate scientists that global temperatures are warming, there is considerable uncertainty regarding the specific spatial and temporal impacts that can be expected. To assess climate trends in New Mexico, the NMOSE and NMISC (2006) conducted

a study of observed climate conditions over the past century and found that observed wintertime average temperatures had increased statewide by about 1.5°F since the 1950s. Predictions of annual precipitation are subject to greater uncertainty "given poor representation of the North American monsoon processes in most climate models" (NMOSE/NMISC, 2006).

A number of other studies predict temperature increases in New Mexico from 5° to 10°F by the end of the century (Forest Guild, 2008; Hurd and Coonrod, 2008; USBR, 2011). Predictions of annual precipitation are subject to greater uncertainty, particularly regarding precipitation during the summer monsoon season in the southwestern U.S.

The Bureau of Reclamation's Water SMART program helps communities assess the impacts of climate change on water supplies (USBR, 2015b). With the assistance of a Bureau of Reclamation Basin Study WaterSMART grant, the City and County of Santa Fe assessed the direct impacts of climate change on their surface water supply sources and the indirect impacts on groundwater sources (USBR, 2015c). Through this study, the City and County and their representatives worked with Bureau of Reclamation experts to better understand likely future effects and associated risks from climate change and to develop climate and hydrology projections associated with the three sub-basins—the Santa Fe River, the upper Rio Grande, and the San Juan River watersheds—that supply water to regional utilities.

The climate modeling portion of the study projected a significant gap between the future supply and the projected demand within the City and County under projected population growth as well as with three different climate change scenarios. The study used localized climate projections to develop hydrographs for regional streams for use in water management modeling.

The study further assessed combinations of management adaptation strategies that could potentially help meet the projected gap. Those possible adaptation strategies included direct or indirect reclaimed water reuse, water conservation, direct injection for aquifer storage and recovery, infiltration for aquifer storage and recovery in the Santa Fe River, and additional surface water rights. A major finding was that no one adaptation strategy could reliably meet future water demands in the Santa Fe region, demonstrating the value of a multi-faceted approach for municipalities.

In a study outside of the region but relevant to northern New Mexico, Salgado and Gutzler (2013) evaluated climate change impacts on water availability in the Upper Pecos River Basin area, reviewing data from New Mexico Climate Division 2 and streamflow records from the Pecos gage located north of Pecos. They concluded:

- The timing of snowmelt runoff has exhibited a trend of earlier runoff that coincides with warmer temperatures in spring and early summer (March through June).

- Within the most recent 30-year period, the warmer spring and early summer temperature changes account for a larger percentage of the variability in streamflow than does precipitation. This shift may be an indicator of increased evaporation due to increased snowmelt season temperatures.

Based on these studies, the effects of climate change that are likely to occur in New Mexico and the planning region include (NMOSE/NMISC, 2006):

- Temperature is expected to continue to rise.
- Higher temperatures will result in a longer and warmer growing season, resulting in increased water demand on irrigated lands and increased evapotranspiration from riparian areas, grasslands, and forests, and thus less recharge to aquifers.
- Reservoir and other open water evaporation are expected to increase. Soil evaporation will also increase.
- Precipitation is expected to be more concentrated and intense, leading to increased projected frequency and severity of flooding.
- Streamflows in major rivers across the Southwest are projected to decrease substantially during this century (e.g., Christensen et al., 2004; Hurd and Coonrod, 2008; USBR, 2011, 2013) due to a combination of diminished cold season snowpack in headwaters regions and higher evapotranspiration in the warm season. The seasonal distribution of streamflow is projected to change as well: flows could be somewhat higher than at present in late winter, but peak runoff will occur earlier and be diminished. Late spring/early summer flows are projected to be much lower than at present, given the combined effects of less snow, earlier melting, and higher evaporation rates after snowmelt.
- Forest habitat is vulnerable to both decreases in cold-season precipitation and increases in warm-season vapor pressure deficit (Williams, 2012). Stress from either of these factors leaves forests increasingly susceptible to insects, forest fires, and desiccation. Greater temperatures increase insect survivability and fire risk.

To minimize the impact of these changes, it is imperative that New Mexico plan for variable water supplies, including focusing on drought planning and being prepared to maximize storage from extreme precipitation events while minimizing their adverse impacts.

5.2 Surface Water Resources

Surface water supplied approximately 78 percent of the water diverted in the Jemez y Sangre Water Planning Region in 2010, with its primary use (93 percent) being for irrigated agriculture.

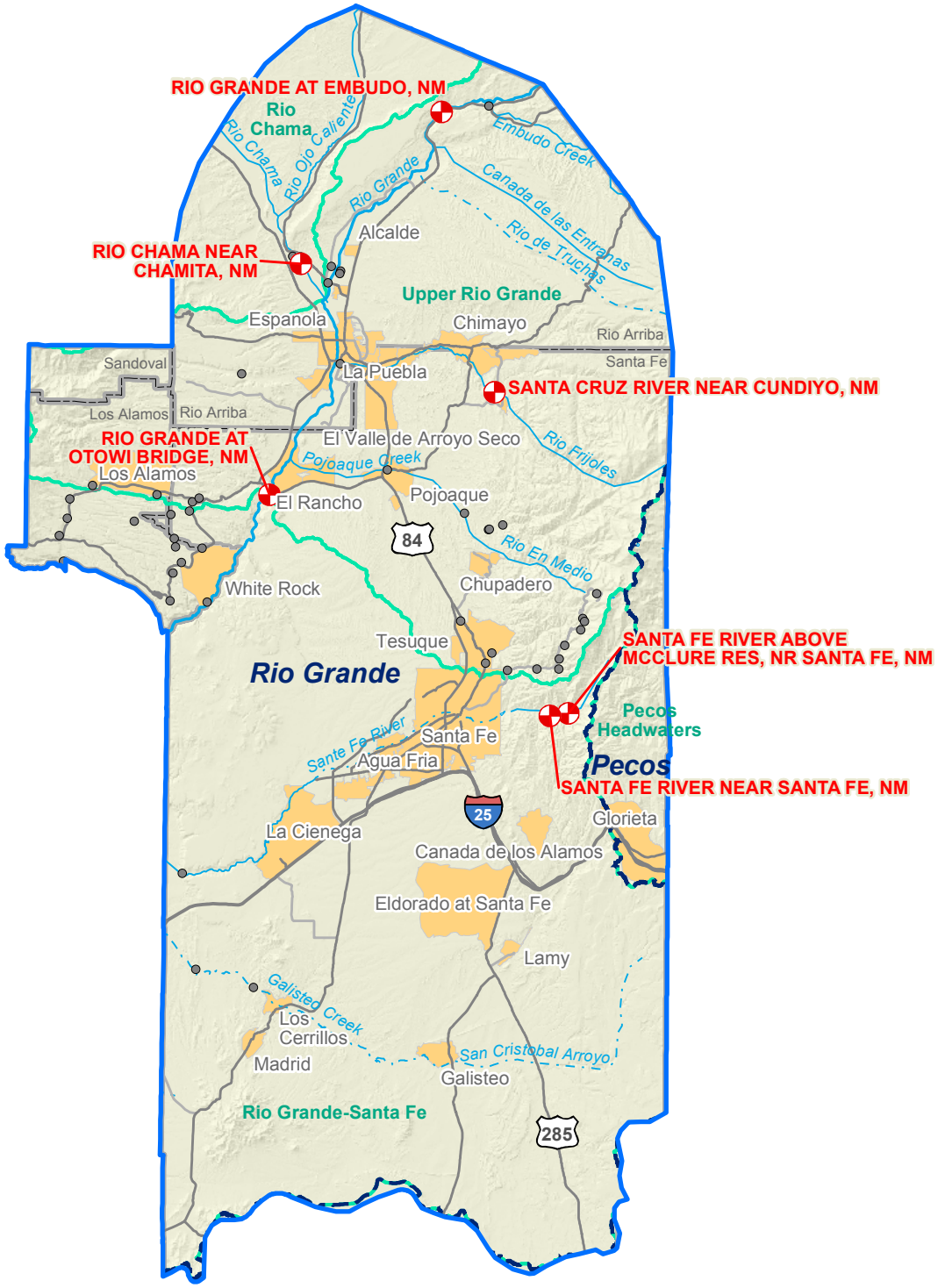
About 7 percent of the surface water diverted in 2010 was used for public water supply. The dominant waterways flowing in the region are Rio Grande and the Rio Chama. The Santa Fe River is also an important supply for the City of Santa Fe. Major surface drainages (including both perennial and intermittent streams) and watersheds in the planning region are shown on Figure 5-7. When evaluating surface water information, it is important to note that streamflow does not represent available supply, as there are also water rights and interstate compact limitations. The administrative water supply discussed in Section 5.5 is intended to represent supply considering both physical and legal limitations, but excluding potential compact limitations. The information provided in this section is intended to illustrate the variability and magnitude of streamflow, and particularly the relative magnitude of streamflow in recent years.

Tributary flow is not monitored in every subwatershed in the planning region. However, streamflow data are collected by the U.S. Geological Survey (USGS) and various cooperating agencies at several stream gage sites in the planning region. Table 5-4a lists the locations and periods of record for data collected at stream gages in the region, as well as the drainage area and estimated irrigated acreage for surface water diversions upstream of the station. Table 5-4b provides the minimum, median, and maximum annual yield for all gages that have 10 or more years of record.

In addition to the large variability in annual yield, streamflow also varies from month to month within a year, and monthly variability or short-term storms can have flooding impacts, even when annual yields are low. Table 5-5 provides monthly summary statistics for each of the stations with 10 or more years of record. As shown on Table 5-5, the months with the highest streamflow are generally April, May, and June, when snowmelt is greatest.

For this water planning update, six stream gages, shown on Figure 5-8, were analyzed in more detail. These stations were chosen because of their locations in the hydrologic system, completeness of record, and representativeness as key sources of supply. Figure 5-8 shows the minimum and median annual water yield for these gages. Figures 5-9a through 5-9c show the annual water yield from the beginning of the period of record through 2013 for the six gages. As shown in these figures, there is considerable variability between the high-flow and low-flow years, though Rio Chama flows reflect reservoir storage and releases and are not as variable as Rio Grande flows above the Rio Chama confluence. The flows at Rio Grande at Otowi (Figure 5-9a), which is below that confluence, include non-native flows from the San Juan-Chama project.

Several lakes and reservoirs store water for use in the planning region. Table 5-6 summarizes the larger lakes and reservoirs (i.e., storage capacity greater than 5,000 acre-feet, as reported in the *New Mexico Water Use by Categories 2010* report [Longworth et al., 2013]). While no reservoirs of this size are located within the Jemez y Sangre planning region, there are several upstream reservoirs that store water for use within the region and elsewhere. The three reservoirs listed in Table 5-6—Heron, El Vado and Abiquiu—are all subject to the storage restrictions of the Rio Grande Compact.



Note: Only those USGS stream gages with daily data are shown.

Source: USGS, 2014c and 2014d

N

0 5 10 Miles

Explanation

- Selected USGS stream gage
- USGS stream gage
- Stream (dashed where intermittent)
- Lake
- River basin
- Watershed
- City
- County
- Water planning region

JEMEZ Y SANGRE
REGIONAL WATER PLAN 2016

Major Surface Drainages, Stream Gages, Reservoirs, and Lakes

Figure 5-7

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Table 5-4a. USGS Stream Gage Stations

USGS Station [a]							Period of Record	
Name [b]	Number	Latitude	Longitude	Elevation (ft amsl)	Drainage Area (sq mi)	Irrigated Upstream Land [c] (acres)	Start Date	End Date
Rio Arriba County								
Embudo Creek at Dixon, NM	08279000	36.2108556	–105.913631	5,859	305	6,600	10/1/1923	Present
Rio Grande at Embudo, NM	08279500	36.2055556	–105.963972	5,789	10,400	620,000 [d] 40,000 [e]	01/01/1889	Present
San Juan Lat Ab San J Pueblo, NM	08280100	36.0675227	–106.06919	5,660	—	—	4/1/1963	9/30/1968
San Juan Pueb D Ab San J Pueb, NM	08280200	36.0653005	–106.070023	5,660	—	—	4/1/1963	9/30/1968
Guique D N San Juan Pueblo, NM	08280700	36.0711337	–106.078912	5,660	—	—	5/1/1963	9/30/1968
Rio Grande Above San Juan Pueblo, NM	08281100	36.0569671	–106.082246	5,630	10,550	—	4/1/1963	5/17/1987
Chamita D Nr Chamita, NM	08289500	36.0791889	–106.111691	5,690	—	—	10/1/1964	9/30/1968
Hernandez D at Hernandez, NM	08289800	36.0797444	–106.120302	5,670	—	—	4/1/1963	9/30/1968
Rio Chama Near Chamita, NM	08290000	36.0735556	–106.111694	5,654	3,144	27,600	10/1/1912	Present
Santa Cruz R A Riverside, NM	08291500	35.9875235	–106.068634	5,580	188	—	1/1/1942	7/31/1951
Santa Clara Creek Near Espanola, NM	08292000	35.9778009	–106.172803	6,120	35	—	10/1/1936	9/30/1994
Los Alamos County								
Los Alamos Canyon at Los Alamos, NM	08313025	35.880024	–106.328917	—	—	—	4/25/1994	1/2/1995
Los Alamos Canyon (Ug) Nr Los Alamos, NM	08313030	35.8728024	–106.260582	—	—	—	6/9/1994	12/31/1994
Canada Del Buey Above White Rock, NM	08313225	35.8353032	–106.241971	—	—	—	12/18/1993	12/31/1994
Canada Del Buey at White Rock, NM	08313230	35.827248	–106.212248	—	—	—	10/1/1992	12/31/1994
Pajarito Canyon Abv NM Hwy 501 Nr White Rock, NM	08313240	35.8683574	–106.353085	—	—	—	12/31/1993	12/31/1994

Source: USGS, 2014c (unless otherwise noted)

[a] Only those USGS stream gages with daily data are shown.

[b] **Bold** indicates gages in key locations selected for additional analysis.

[c] Source: DBS&A, 2003; USGS, 2014a

[d] In Colorado

[e] In New Mexico

USGS = U.S. Geological Survey

ft amsl = Feet above mean sea level

sq mi = Square miles

NA = Not available

— = Data not available from current source(s).

Table 5-4a. USGS Stream Gage Stations

USGS Station [a]							Period of Record	
Name [b]	Number	Latitude	Longitude	Elevation (ft amsl)	Drainage Area (sq mi)	Irrigated Upstream Land [c] (acres)	Start Date	End Date
Los Alamos County (cont.)								
Pajarito Canyon Abv Ta-18 Nr White Rock, NM	08313245	35.8497471	–106.284472	—	—	—	11/1/1993	12/31/1994
Pajarito Canyon Abv NM Hwy 4 Nr White Rock, NM	08313250	35.8280811	–106.240304	—	—	—	11/23/1993	12/31/1994
Water Cyn Abv NM Hwy 501 Nr Los Alamos, NM	08313252	35.8364136	–106.363362	—	—	—	10/1/1994	12/31/1994
Canon De Valle Abv NM Hwy 501 Nr Los Alamos, NM	08313253	35.8516911	–106.355307	—	—	—	10/1/1994	12/31/1994
Portillo Canyon Nr White Rock, NM	08313255	35.8147481	–106.233915	—	—	—	3/9/1994	12/31/1994
Water Canyon Blw NM Hwy 4 Nr White Rock, NM	08313265	35.8055816	–106.242804	—	—	—	1/5/1994	12/31/1994
Ancho Canyon Nr Bandalier Nat Monument, NM	08313275	35.7816931	–106.245582	—	—	—	10/1/1994	12/31/1994
Rito De L Frijoles Nr Los Alamos, NM	08313300	35.8146806	–106.35855	7,003	9	—	10/1/1960	10/31/1963
Santa Fe County								
Santa Cruz River Near Cundiyo, NM	08291000	35.9647222	–105.904722	6,460	86	1,000	10/1/1932	Present
Rio Nambe Above Nambe Falls Dam Near Nambe, NM	08294195	35.8500556	–105.894444	6,885	25	—	10/1/2001	6/13/2012
Rio Nambe Below Nambe Falls Dam Near Nambe, NM	08294210	35.8461111	–105.909722	6,840	34	NA	1/1/1979	Present
Rio Nambe at Nambe Falls, Nr Nambe, NM	08294300	35.8461386	–105.908632	6,514	25	—	3/1/1963	12/31/1978

Source: USGS, 2014c (unless otherwise noted)

[a] Only those USGS stream gages with daily data are shown.

[b] **Bold** indicates gages in key locations selected for additional analysis.

[c] Source: DBS&A, 2003; USGS, 2014a

[d] In Colorado

[e] In New Mexico

USGS = U.S. Geological Survey

ft amsl = Feet above mean sea level

sq mi = Square miles

NA = Not available

— = Data not available from current source(s).

Table 5-4a. USGS Stream Gage Stations

Page 3 of 4

USGS Station [a]							Period of Record	
Name [b]	Number	Latitude	Longitude	Elevation (ft amsl)	Drainage Area (sq mi)	Irrigated Upstream Land [c] (acres)	Start Date	End Date
Santa Fe County (cont.)								
Rio Nambe Near Nambe, NM	08295000	35.8597492	–105.935299	6,280	38	—	10/1/1932	9/30/1951
Rio En Medio Nr Santa Fe, NM	08295200	35.7916961	–105.794463	10,600	1	—	10/1/1963	10/31/1973
Pojoaque C A Pojo B N Nambe, NM	08301000	35.89665	–106.01725	5,830	89	—	3/1/1936	9/30/1941
Nf Tesuque C Nr Santa Fe, NM	08302200	35.7700297	–105.809186	9,670	2	—	10/1/1962	9/30/1970
Mf Tesuque C Nr Santa Fe N Mex	08302300	35.7675298	–105.807519	9,770	0	—	12/1/1961	9/30/1970
Sf Tesuque C Nr Santa Fe N Mex	08302400	35.7603077	–105.811408	9,740	0	—	10/1/1962	9/30/1970
Tesuque Creek Above Diversions Near Santa Fe, NM	08302500	35.7395556	–105.904953	7,112	12	NA	4/1/1936	Present
L Tesuque C Nr Santa Fe N Mex	08304100	35.7466967	–105.828075	9,020	1	—	7/1/1962	9/30/1970
L Tesuque C Tr 4 Nr Santa Fe, NM	08304200	35.7353081	–105.833631	8,600	1	—	10/1/1964	9/30/1970
L Tesuque C Tr 3 Nr Santa Fe, NM	08304300	35.7264194	–105.834186	8,460	1	—	10/1/1963	9/30/1970
L Tesuque C Tr 2 Nr Santa Fe, NM	08304400	35.7261415	–105.857242	7,960	0	—	10/1/1968	9/30/1970
Little Tesuque C N San Fe, NM	08305000	35.7250301	–105.888076	7,520	7	—	4/1/1936	9/30/1941
Little Tesuque Cr at Bishops Lodge Nr Santa Fe, NM	08305030	35.7311111	–105.911389	7,100	8	—	7/10/1999	9/30/2009
Rio Tesuque at Grant Boundary at Tesuque, NM	08308025	35.7669731	–105.938077	—	—	—	5/28/1998	9/30/1999
Rio Grande at Otowi Bridge, NM	08313000	35.8745	–106.142444	5,488	14,300	620,000 [d] 75,000 [e]	2/1/1895	Present
Los Alamos Canyon (Lg) Nr Los Alamos, NM	08313042	35.8669694	–106.223081	6,380	9	—	10/1/1991	9/30/1995

Source: USGS, 2014c (unless otherwise noted)

[a] Only those USGS stream gages with daily data are shown.

[b] **Bold** indicates gages in key locations selected for additional analysis.

[c] Source: DBS&A, 2003; USGS, 2014a

[d] In Colorado

[e] In New Mexico

USGS = U.S. Geological Survey

ft amsl = Feet above mean sea level

sq mi = Square miles

NA = Not available

— = Data not available from current source(s).

Table 5-4a. USGS Stream Gage Stations

USGS Station [a]							Period of Record	
Name [b]	Number	Latitude	Longitude	Elevation (ft amsl)	Drainage Area (sq mi)	Irrigated Upstream Land [c] (acres)	Start Date	End Date
Santa Fe County (cont.)								
Pueblo Canyon Near Los Alamos, NM	08313060	35.8703027	–106.216137	6,330	7	—	1/1/1992	9/30/1995
Sandia Canyon at NM Hwy 4 Nr White Rock, NM	08313125	35.858914	–106.226415	—	—	—	11/24/1993	12/31/1994
Mortandad Canyon Nr Los Alamos, NM	08313204	35.8561361	–106.245582	—	—	—	10/1/1993	12/31/1994
Rio Grande Near White Rock, NM	08313268	35.78086	–106.206415	5,420	14,170	—	6/24/2000	9/30/2003
Santa Fe River Above Mcclure Res, Nr Santa Fe, NM	08315480	35.6886944	–105.824083	7,920	14	NA	7/1/1998	Present
Santa Fe River Near Santa Fe, NM	08316000	35.6864444	–105.843611	7,720	18	NA	2/1/1913	Present
Santa Fe River Above Cochiti Lake, NM	08317200	35.5472222	–106.228889	5,505	231	NA	3/20/1970	Present
Galisteo Creek Above Galisteo Reservoir, NM	08317850	35.4494813	–106.1528	5,595	567	—	5/1/1970	9/30/1976
Galisteo Creek Below Galisteo Dam, NM	08317950	35.4646528	–106.213389	5,450	596	50	3/20/1970	Present

Source: USGS, 2014c (unless otherwise noted)

[a] Only those USGS stream gages with daily data are shown.

[b] **Bold** indicates gages in key locations selected for additional analysis.

[c] Source: DBS&A, 2003; USGS, 2014a

[d] In Colorado

[e] In New Mexico

USGS = U.S. Geological Survey

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sq mi = Square miles

NA = Not available

— = Data not available from current source(s).

Table 5-4b. USGS Stream Gage Annual Statistics for Stations with 10 or More Years of Record

USGS Station Name [a]	Annual Yield [b] (acre-feet)			Number of Years [c]
	Minimum	Median	Maximum	
Rio Arriba County				
Embudo Creek at Dixon, NM	8,253	51,112	179,616	79
Rio Grande at Embudo, NM	201,118	508,008	1,542,050	82
Rio Grande Above San Juan Pueblo, NM	198,367	540,152	1,227,124	22
Rio Chama Near Chamita, NM	159,780	388,553	723,388	43
Santa Clara Creek Near Espanola, NM	2,085	2,860	4,322	13
Santa Fe County				
Santa Cruz River Near Cundiyo, NM	5,604	19,764	59,800	80
Rio Nambe Above Nambe Falls Dam Near Nambe, NM	2,078	6,784	13,249	10
Rio Nambe Below Nambe Falls Dam Near Nambe, NM	2,375	9,050	19,547	34
Rio Nambe at Nambe Falls, Nr Nambe, NM	4,127	6,327	20,054	15
Rio Nambe Near Nambe, NM	2,157	7,171	23,095	18
Tesuque Creek Above Diversions Near Santa Fe, NM	297	1,991	6,856	29
Rio Grande at Otowi Bridge, NM	433,584	983,871	1,993,081	43
Santa Fe River Above Mcclure Res, Nr Santa Fe, NM	738	3,866	8,543	14
Santa Fe River Near Santa Fe, NM	717	4,956	19,909	96
Santa Fe River Above Cochiti Lake, NM	2,360	6,161	28,886	36
Galisteo Creek Below Galisteo Dam, NM	88	3,149	9,484	43

Source: USGS, 2014c

[a] Stations with complete years of data only
Bold indicates gages in key locations selected for additional analysis.

[b] Based on calendar years;

[c] Number of years used in calculation of annual yield statistics

Table 5-5. USGS Stream Gage Average Monthly Streamflow for Stations with 10 or More Years of Record

USGS Station [a]	Complete Years [b]	Average Monthly Streamflow [c] (acre-feet)											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rio Arriba County													
Embudo Creek at Dixon, NM	79	1,782	1,695	2,867	8,229	18,237	10,878	2,840	2,909	2,335	2,261	2,113	1,933
Rio Grande at Embudo, NM	82	31,168	31,800	43,995	57,877	119,023	108,598	45,024	27,016	22,514	25,879	32,464	31,740
Rio Grande Above San Juan Pueblo, NM	22	30,543	31,605	46,351	51,848	102,714	114,128	51,448	30,300	22,875	26,295	35,759	31,217
Rio Chama Near Chamita, NM	43	11,785	13,106	26,269	61,074	88,517	60,253	36,604	30,330	25,626	17,671	15,652	17,755
Santa Clara Creek Near Espanola, NM	13	205	206	256	345	479	256	219	217	222	208	216	216
Santa Fe County													
Santa Cruz River Near Cundiyo, NM	80	570	576	1,271	2,998	5,838	4,244	1,678	1,573	1,157	938	724	632
Rio Nambe Above Nambe Falls Dam Near Nambe, NM	10	213	217	464	871	1,620	1,201	574	550	381	368	283	240
Rio Nambe Below Nambe Falls Dam Near Nambe, NM	34	110	131	332	894	2,102	2,246	1,160	886	652	388	192	136
Rio Nambe at Nambe Falls, Nr Nambe, NM	15	221	201	304	685	1,412	1,415	758	666	545	424	323	260
Rio Nambe Near Nambe, NM	18	222	188	295	875	1,942	1,492	631	529	477	449	316	238
Tesuque Creek Above Diversions Near Santa Fe, NM	29	52	57	128	314	560	306	117	118	89	91	68	56
Rio Grande at Otowi Bridge, NM	43	46,777	47,902	79,199	124,815	206,470	171,277	87,459	59,763	51,517	46,703	52,903	53,785
Santa Fe River Above McClure Res, Nr Santa Fe, NM	14	96	122	284	649	1,106	473	207	383	263	142	129	102

Source: USGS, 2014c

[a] **Bold** indicates gages in key locations selected for additional analysis.

[b] Monthly statistics are for complete months with locations where 10 or more years of complete data were available.

[c] Data from USGS monthly statistics averaged over the entire period of record, converted to acre-feet (from cubic feet per second) and rounded to the nearest acre-foot.

USGS = U.S. Geological Survey

Table 5-5. USGS Stream Gage Average Monthly Streamflow for Stations with 10 or More Years of Record

USGS Station [a]	Complete Years [b]	Average Monthly Streamflow [c] (acre-feet)											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Santa Fe County (cont.)													
Santa Fe River Near Santa Fe, NM	96	137	148	286	705	1,352	979	562	522	400	288	168	142
Santa Fe River Above Cochiti Lake, NM	36	624	565	666	1,052	949	698	445	406	400	409	498	616
Galisteo Creek Below Galisteo Dam, NM	43	66	97	139	127	132	330	997	912	627	266	70	62

Source: USGS, 2014

[a] **Bold** indicates gages in key locations selected for additional analysis.

USGS = U.S. Geological Survey

[b] Monthly statistics are for complete months with locations where 10 or more years of complete data were available.

[c] Data from USGS monthly statistics averaged over the entire period of record, converted to acre-feet (from cubic feet per second) and rounded to the nearest acre-foot.

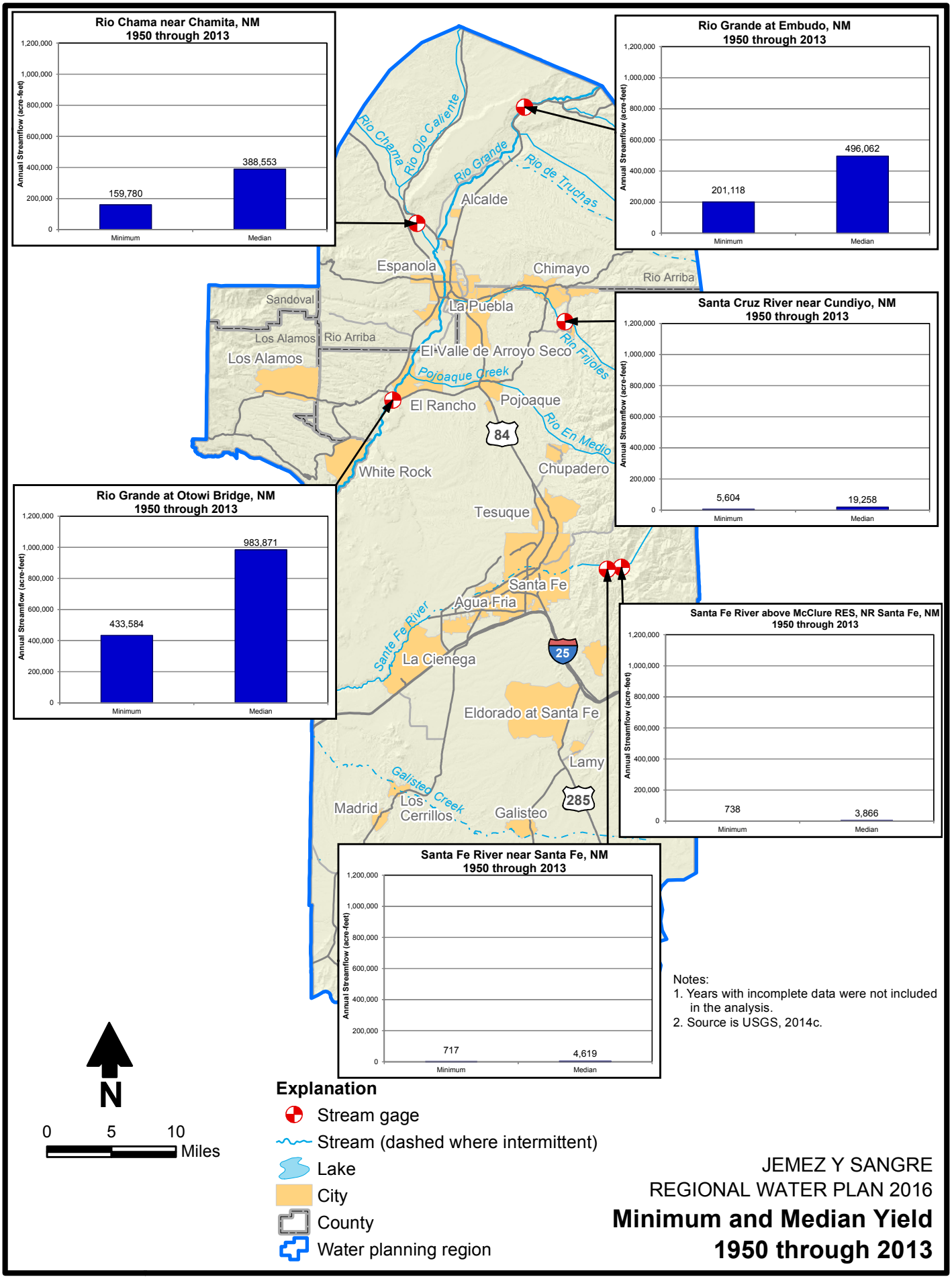

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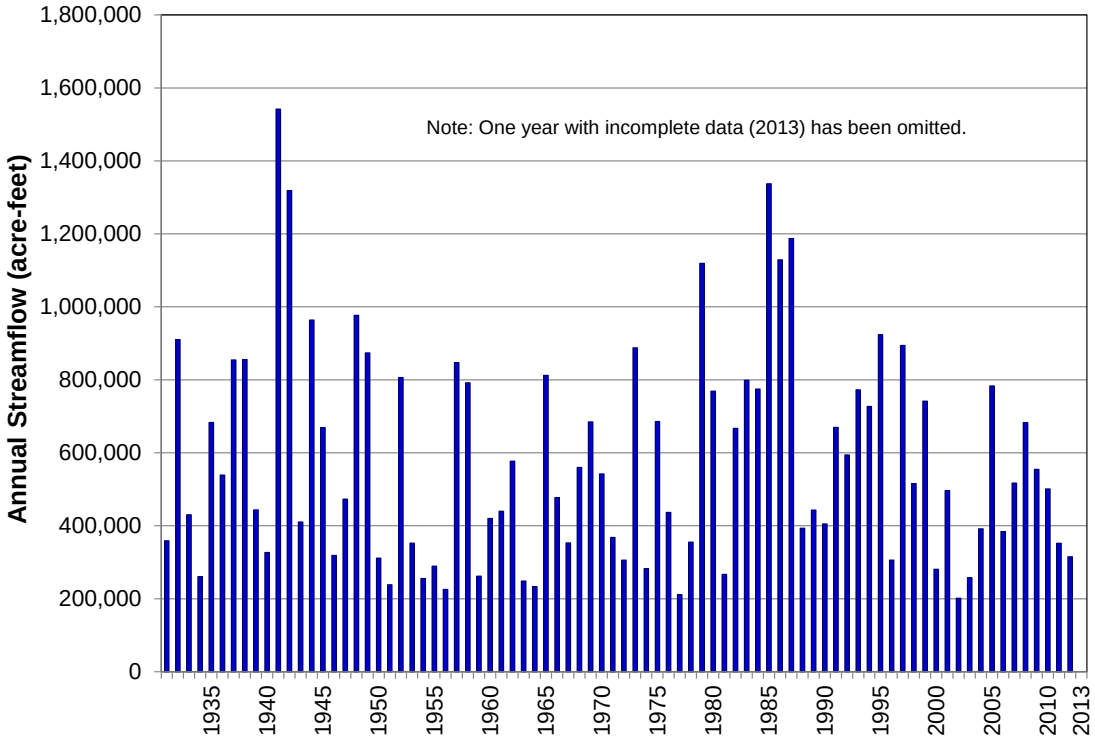
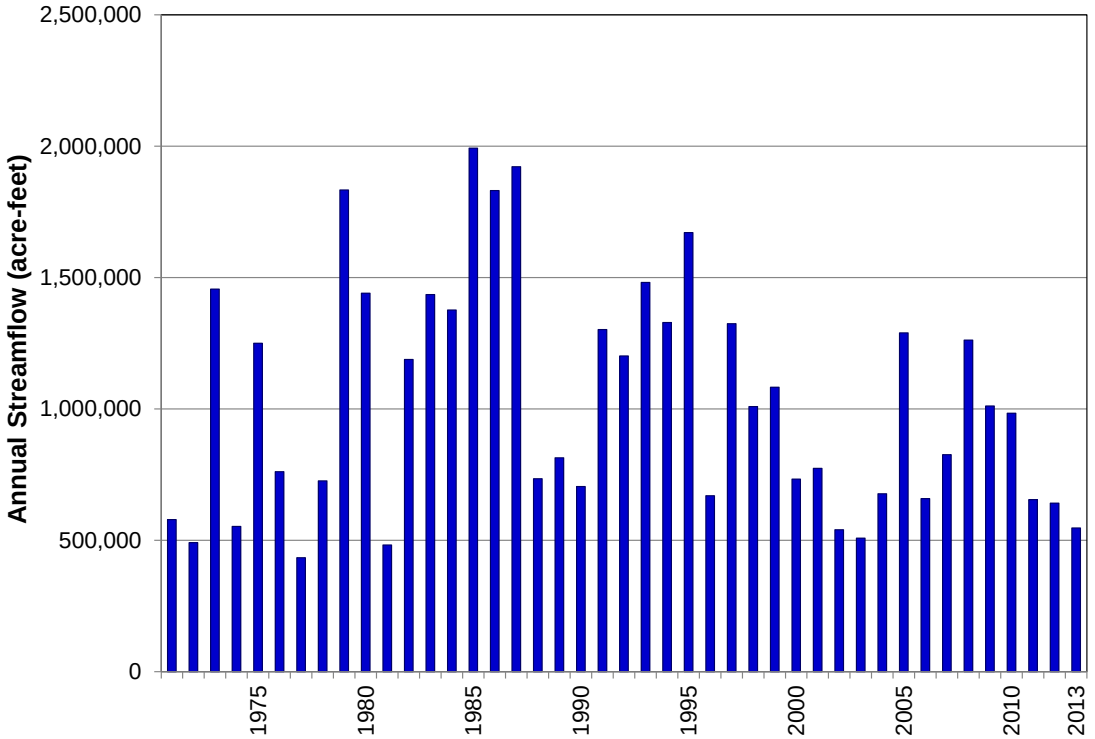
Figure 5-8

Rio Grande at Embudo, NM



Rio Grande at Otowi Bridge, NM



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Annual Streamflow for Selected Gaging Stations on the Rio Grande

Figure 5-9a

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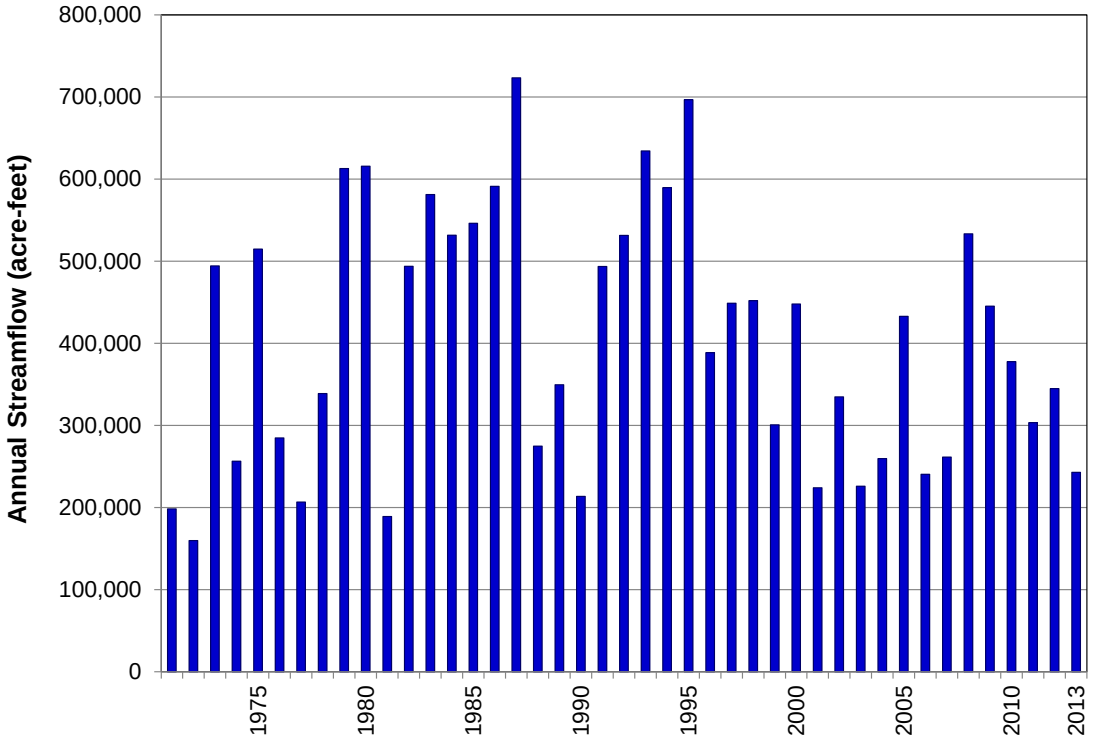
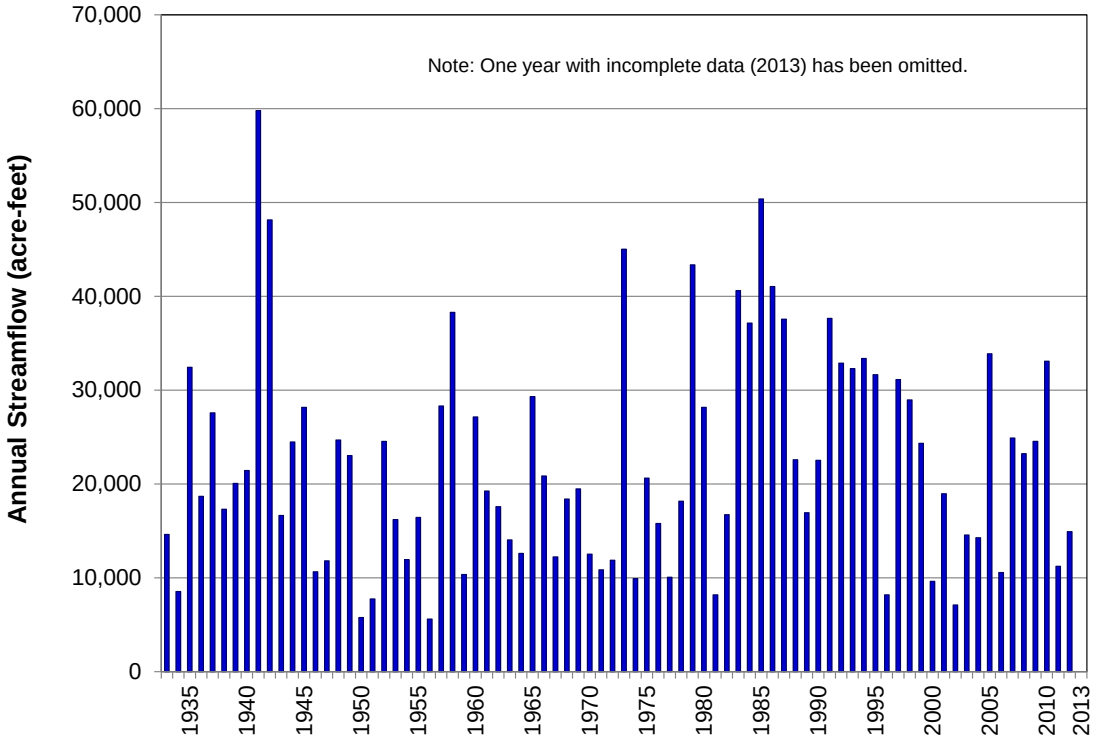
Rio Chama near Chamita, NM



Santa Cruz River near Cundiyo, NM



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Annual Streamflow for Selected Gaging Stations on the Rio Chama and Santa Cruz River

Figure 5-9b

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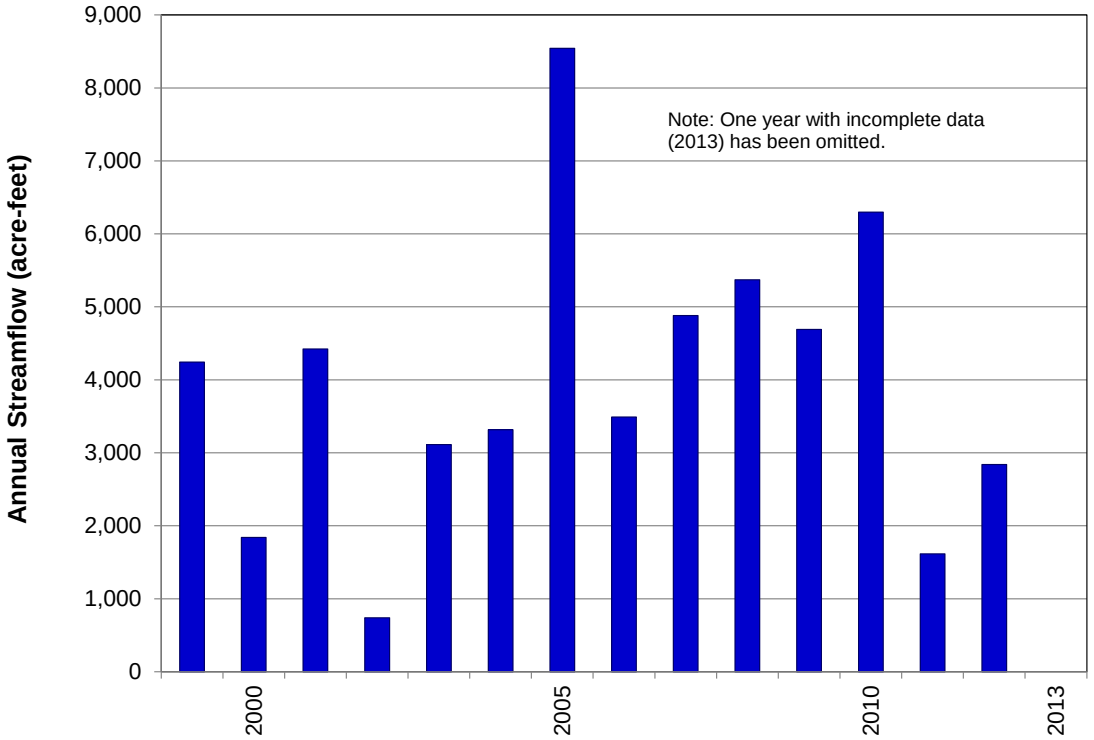
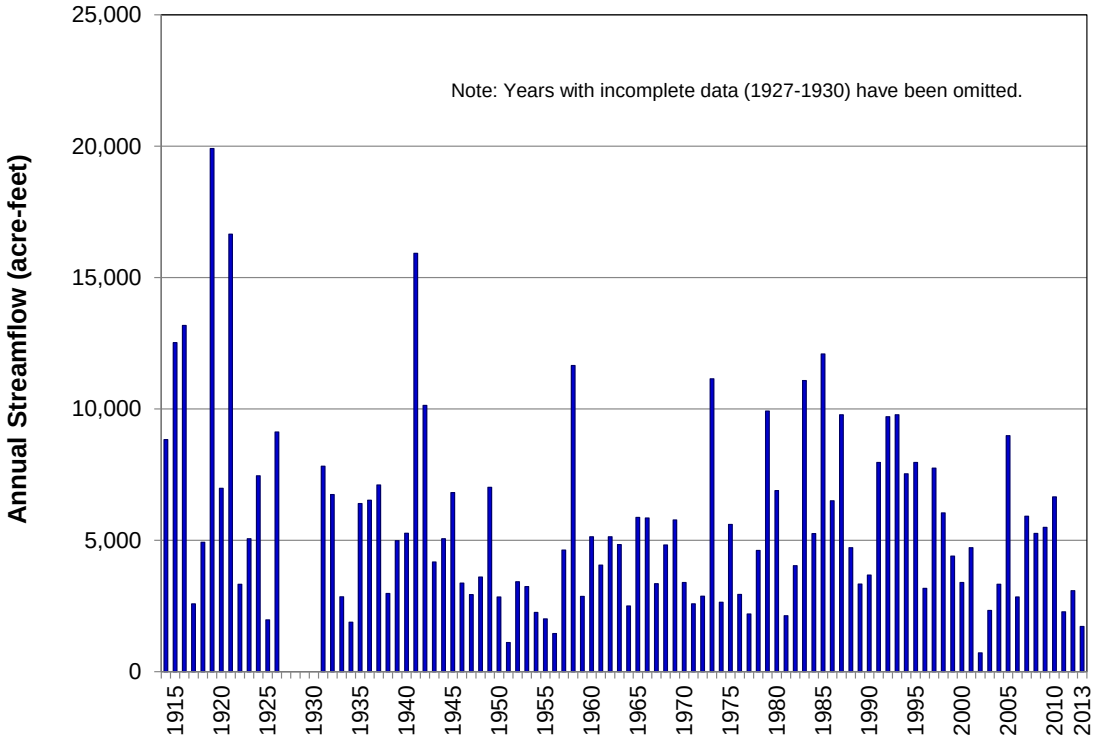
Santa Fe River above McClure Res, NR Santa Fe, NM



Santa Fe River near Santa Fe, NM



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REGIONAL WATER PLAN 2016

Annual Streamflow for Selected Gaging Stations on the Santa Fe River

Figure 5-9c

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Table 5-6. Reservoirs and Lakes (greater than 5,000 acre-feet) Supplying the Jemez y Sangre Water Planning Region

River	Reservoir [a]	Primary Purpose	Operator	Date Completed	Total Storage Capacity (acre-feet)	Surface Area (acres)	Dam Height (feet)	Dam Length (feet)
Rio Arriba County								
Willow Creek/Rio Chama	Heron Dam	Irrigation	Bureau of Reclamation	1970	429,646	5,905	269	1,220
Rio Chama	El Vado Reservoir	Irrigation	Bureau of Reclamation	1934	209,330	3,380	230	1,326
	Abiquiu Dam	Flood control	U.S. Army Corps of Engineers	1963	1,369,000	3,900	340	1,800

Source: USACE, 1999

[a] Reservoirs are upstream of Jemez y Sangre region, but are included because of their relevance to the region.

In addition to the reservoirs shown in Table 5-6, several smaller lakes and reservoirs are present in the region; information on these smaller reservoirs was included in the accepted plan (DBS&A and Lewis, 2003). As discussed in the 2003 plan, the largest storage reservoirs in the planning region are Santa Cruz Lake on the Santa Cruz River, Nambe Falls Reservoir on the Rio Nambe, and Nichols and McClure reservoirs on the Santa Fe River all of which store less than 5,000 acre-feet of water. Inflows and outflows from these reservoirs vary seasonally and annually, and storage levels may drop considerably during particularly dry years. Santa Cruz Lake, Nambe Falls Reservoir, and a portion (a little over 1,000 acre-feet) of the combined capacity of Nichols and McClure reservoirs are not subject to the storage restrictions of the Rio Grande Compact.

The NMOSE conducts periodic inspections of non-federal dams in New Mexico to assess dam safety issues. Dams that equal or exceed 25 feet in height that impound 15 acre-feet of storage or dams that equal or exceed 6 feet in height and impound at least 50 acre-feet of storage are under the jurisdiction of the State Engineer. Dams with unsatisfactory conditions are those that require immediate or remedial action. Dams identified in recent inspections as being deficient, with high or significant hazard potential, are summarized in Table 5-7.

5.3 Groundwater Resources

Groundwater accounted for about 22 percent of all water diversions in the year 2010 (Longworth et al., 2013). It provides important drinking water supplies for many small systems and domestic wells in the region, and also provides a backup conjunctive use supply for the City and County of Santa Fe.

5.3.1 Regional Hydrogeology

The geology that controls groundwater occurrence and movement within the planning region was described in the accepted *Jemez y Sangre Regional Water Plan* (DBS&A and Lewis, 2003), based on numerous studies that have been conducted in the region (as cited in the summary discussion below). A map illustrating the surface geology of the planning region, derived from a geologic map of the entire state of New Mexico by the New Mexico Bureau of Geology & Mineral Resources (2003), is included as Figure 5-10. Figure 5-10 also shows the approximate extent of physiographic provinces within the planning region. A summary of the hydrogeology of the region based on the original plan (DBS&A and Lewis, 2003) and the Long-Range Water Supply Plan for Los Alamos County (DBS&A, 2006), follows.

The Jemez y Sangre Water Planning Region lies within the Española Basin (Kelley, 1977). This structural geologic basin is centered near the City of Española and the confluence of the Rio Grande and the Rio Chama. The basin encompasses the Española Valley, which is generally considered to comprise the lower-lying areas within the structural basin. The Sangre de Cristo Mountains form the eastern boundary of the basin, and the Jemez Mountains, the western boundary (hence the name of the planning region).

Table 5-7. Dams with Dam Safety Deficiency Rankings

Page 1 of 2

Dam	Condition Assess-ment [a]	Deficiency	Hazard Potential [b]	Estimated Cost to Repair ($)
Rio Arriba County				
La Mesilla Site 1 Dam	Poor	Lack of design information	High	100,000
Santa Cruz Site 1 Dam	Poor	Spillway capacity 86% of required flood Maintenance needed Lack of design information	High	150,000
Santa Cruz Site 2G Dam	Poor	Spillway capacity 82% of required flood Maintenance needed Lack of design information	High	150,000
Santa Cruz Site 3 Dam	Poor	Spillway capacity 10% of required flood Maintenance needed	High	2,500,000
Santa Cruz Site 3A Dam	Poor	Spillway capacity 87% of required flood Maintenance needed Lack of design information	High	100,000
Santa Cruz Site 4 Dam	Fair	Spillway capacity 60% of required flood Maintenance needed	High	2,500,000
Santa Cruz Site 5 Dam	Poor	Spillway capacity 70% of required flood Maintenance needed Lack of design information	High	100,000
Sebastian Martin BM 1 Dam	Poor	Repair intake & trash racks Maintenance needed Lack of design information	High	100,000
Sebastian Martin Site 2 Dam	Poor	Maintenance needed Lack of design information	High	100,000
Sebastian Martin Site 18 Dam	Poor	Maintenance needed Lack of design information	High	100,000
Sebastian Martin Site 3 Dam	Poor	Maintenance needed Lack of design information	High	100,000
Sebastian Martin Site 4 Dam	Poor	Maintenance needed Lack of design information	High	100,000
Sebastian Martin Site 5 Dam	Poor	Maintenance needed Excavation In spillway	High	100,000
Sebastian Martin Site 6 Dam	Poor	Maintenance needed Lack of design information	High	100,000
Santa Fe County				
Santa Cruz Site 6 Dam	Poor	Spillway capacity 70% of required flood Lack of design information	High	100,000

Source: NMOSE, 2014b

[a] Assessment criteria are attached at the end of this table.

[b] Hazard potential classifications are attached at the end of this table.

PMP= Probable maximum precipitation

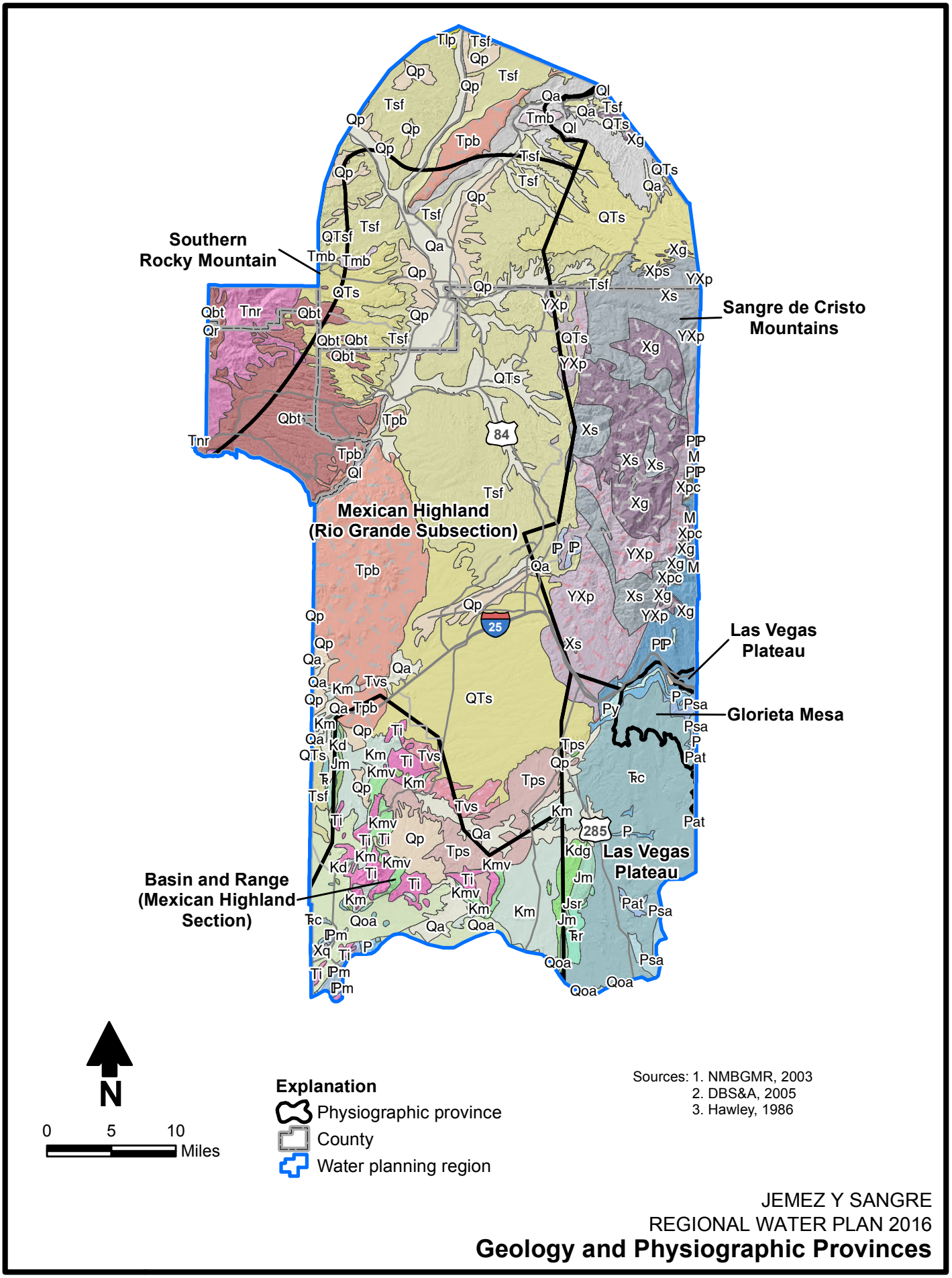
Table 5-7. Dams with Dam Safety Deficiency Rankings

[a] Condition assessment:

	2008 US Army Corps of Engineers Criteria (adopted by NM OSE in FY09)	*NMOSE Spillway Risk Guidelines*
Fair:	No existing dam safety deficiencies are recognized for normal loading conditions. Rare or extreme hydrologic and/or seismic events may result in a dam safety deficiency. Risk may be in the range [for the owner] to take further action.	Spillway capacity < 70% but ≥ 25% of the SDF.
Poor:	A dam safety deficiency is recognized for loading conditions, which may realistically occur. Remedial action is necessary. A poor condition is also used when uncertainties exist as to critical analysis parameters, which identify a potential dam safety deficiency. Further investigations and studies are necessary.	Spillway capacity < 25% of the SDF.

[b] Hazard Potential Classifications:

High: Dams where failure or mis-operation would likely result in loss of human life.



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Geology and Physiographic Provinces

Figure 5-10a

Geology Explanation

- ℙ - Pennsylvanian rocks undivided
- ℙm - Madera Group
- ℙs - Sandia Formation
- J - Upper and Middle Jurassic rocks, undivided
- Jm - Morrison Formation
- Jsr - San Rafael Group
- Kd - Dakota Sandstone
- Kdg - Dakota Group
- Km - Mancos Shale
- Kmv - Mesaverde Group
- Ku - Upper Cretaceous Rocks of southwestern New Mexico, undivided
- M - Mississippian rocks, undivided
- P - Permian rocks, undivided
- ℙP - Permian and Pennsylvanian rocks, undivided
- Pa - Abo Formation
- Pat - Artesia Group
- Psa - San Andres Formation
- Py - Yeso Formation
- QTs - Upper Santa Fe Group
- QTsf - Santa Fe Group, undivided
- Qa - Alluvium
- Qbt - Bandelier Tuff
- Qe - Eolian deposits
- Ql - Landslide deposits and colluvium
- Qoa - Older alluvial deposits of upland plains and piedmont areas, and calcic soils and eolian cover sediments of High Plains region
- Qp - Piedmont alluvial deposits
- Qr - Older rhyolite lavas and early volcaniclastic sedimentary fill deposits of the Valles Caldera
- Ti - Tertiary intrusive rocks of intermediate to silicic composition
- Tlp - Los Pinos Formation of lower Santa Fe Group
- Tmb - Basaltic to andesitic lava flows
- Tnr - Silicic to intermediate volcanic rocks
- Tnv - Intermediate to silicic volcanic rocks
- Tpb - Basaltic to andesitic lava flows
- Tps - Paleogene sedimentary units
- Tsf - Lower Santa Fe Group
- Tvs - Middle Tertiary volcaniclastic sedimentary units
- Xg - Paleoproterozoic granitic plutonic rocks
- Xpc - Paleoproterozoic calc-alkaline plutonic rocks
- Xps - Paleoproterozoic pelitic schist
- Xq - Paleoproterozoic quartzite
- Xs - Paleoproterozoic metasedimentary rocks
- Xvf - Paleoproterozoic rhyolite and felsic volcanic schist
- Xvm - Paleoproterozoic mafic metavolcanic rocks with subordinate felsic metavolcanic rocks
- YXp - Mesoproterozoic and Paleoproterozoic plutonic rocks, undivided
- Ŧr - Triassic rocks, undivided
- Ŧrc - Chinle Group
- Ŧrr - Redonda Formation

Source: NMBGMR, 2003

JEMEZ Y SANGRE
REGIONAL WATER PLAN 2016
Geology Explanation

Figure 5-10b

S:\PROJECTS\WR12.0165_STATE_WATER_PLAN_2012\GIS\MXDS\FIGURES_2016\JEMEZ_Y_SANGRE\FIG5-10B_GEOLOGY_EXPLANATION.MXD 6/11/2016

The Sangre de Cristo Mountains in the eastern part of the planning region are covered by Precambrian rocks, which are inferred to exist under the entire study area. The Precambrian rocks have relatively low permeability and storage capacity, but can transmit water though fractures to overlying younger sediments. Paleozoic rocks are found intermittently along the west flank of the Sangre de Cristo Mountains; however, most of the sediments lying within the Española Basin comprise the geologic unit known broadly as the Santa Fe Group. This group consists primarily of the Tesuque, Puye, and Ancha Formations.

Permian and Mesozoic rocks crop out south of the Santa Fe River watershed. Lower and middle Tertiary units, consisting of the Galisteo Formation and extrusive and intrusive rocks, are exposed in the southern part of the Jemez y Sangre planning region. The Galisteo Formation consists of sandstone, mudstone, and conglomerate (Kelley, 1978). Typically, the Galisteo and associated igneous units, along with the Permian and Mesozoic formations in the area, have low permeability and form a bedrock floor that controls the accumulation and movement of groundwater in overlying sediments (Spiegel and Baldwin, 1963).

The Tertiary Tesuque Formation of the Santa Fe Group consists of reddish brown and pinkish tan silty sand and gravel derived largely from the Sangre de Cristo Mountains (Spiegel and Baldwin, 1963). With a thickness of more than 9,000 feet near the Rio Grande (Kelley, 1978), the Tesuque is the principal groundwater-bearing unit in the planning region and is sometimes referred to as the Tesuque Formation aquifer. The Tesuque Formation consists of interbedded layers of gravel, sand, silt, and clay with some intercalated volcanic ash beds. Because of its stratification and the dipping of its sedimentary beds, the aquifer is considered anisotropic, with the primary hydraulic conductivity direction occurring along its bedding planes. Horizontal flow is faster than downward flow.

The Puye Formation of the Santa Fe Group is present on the western side of the Rio Grande in Los Alamos County (Griggs, 1964; Purtymun and Johanson, 1974) and is covered by Bandelier Tuff in the Jemez Mountains area. Los Alamos County is situated on the Pajarito Plateau within the western margin of the Española Basin. The hydrogeologic framework within Los Alamos County consists of three distinct aquifer systems:

- Shallow perched groundwater in alluvial deposits along canyon bottoms
- Intermediate-depth perched groundwater
- Deeper, regional aquifer

Alluvial aquifers occur within axial fluvial deposits located along canyon bottoms and have a limited saturated thickness (generally a few feet) and variable lateral extent depending on the presence of intermittent surface flow or anthropogenic discharges from water treatment outfalls. Though their limited extent precludes any utility for beneficial use, these aquifers provide an important pathway for contaminant migration.

Intermediate-depth perched aquifers are widely distributed across the northern and central parts of the Pajarito Plateau at depths ranging from 118 to 894 feet beneath Los Alamos Canyon, Pueblo Canyon, Sandia Canyon, Mortandad Canyon, and Cañon de Valle. These perched zones usually occur in the Puye Formation fanglomerates, the Cerros del Rio Basalt, and units of the Bandelier Tuff, and are typically associated with low-permeability layers such as unfractured basalt flows and clay-rich zones. Saturated thicknesses range from about 3 to 420 feet, but lateral extents are poorly defined (LANL, 2005a). Again, the generally small extent of these aquifers limits their potential for beneficial use, but they provide an important pathway for contaminant migration through the vadose zone.

The regional aquifer occurs at depths up to approximately 1,150 feet beneath the plateau and is the primary source of water supply for Los Alamos County. This aquifer occurs primarily within the poorly to semi-consolidated basin-fill sediments of the Santa Fe Group. The total thickness of the Santa Fe Group beneath the Pajarito Plateau is poorly defined. Estimates of the total thickness of these sediments range from 6,650 feet in the central basin to as much as 9,000 to 10,000 feet in the central and western parts of the basin (Broxton and Vaniman, 2005).

The regional aquifer extends into the overlying Puye Formation fanglomerate beneath parts of the Pajarito Plateau. Other geologic units encompassed by the regional aquifer beneath parts of the county include fractured volcanic rocks of the Tschicoma Formation (western part) and the Cerros del Rio Basalt (eastern part) as well as localized occurrences of older basalts.

The Ancha Formation of the Santa Fe Group occurs north of Galisteo Creek. The Ancha is more permeable than the Tesuque Formation and is as thick as 300 feet in some areas. In most locales, the Ancha Formation is above the water table; however, when the formation is underlain by a low-permeability unit, it can accumulate water. Recent studies of the Santa Fe Group have further subdivided the Ancha and Tesuque formations and improved the understanding of the extent and saturation of these formations (Johnson et al., 2008; Johnson and Koning, 2009, 2012; Koning and Read, 2010).

Shallow alluvial deposits, younger than the Santa Fe Group, lie beneath and adjacent to the Rio Grande and its main tributaries throughout the planning region. These deposits are better sorted and have a larger average grain size than the sediments comprising the Tesuque Formation. The shallow alluvial deposits vary from about 2 miles wide along the Rio Grande to less than a few hundred feet wide along the tributaries. The deposits are at least 55 feet thick along the Rio Grande (Galusha and Black, 1971) and less than 100 feet thick along the tributaries (Hearne, 1985).

5.3.2 Aquifer Conditions

As reported in the accepted regional water plan (DBS&A and Lewis, 2003), the primary aquifer in the region is the Santa Fe Group. Hydraulic conductivity is greater in the upper portion of the

Santa Fe Group than in the lower portions of the group. Estimates of hydraulic conductivity for the upper portion (Ancha Formation) range from 3 feet per day (ft/d) to 21 ft/d, while in the lower portion of the Santa Fe Group (Tesuque Formation), hydraulic conductivity estimates vary from 0.5 to 2 ft/d with a most likely value of 1 ft/d (Hearne, 1985). Although the Ancha Formation is more permeable (higher conductivity), the Tesuque Group has substantially greater saturated thicknesses, which leads to higher transmissivities.

In order to evaluate changes in water levels over time, the USGS monitors groundwater wells throughout New Mexico (Figure 5-11). Hydrographs illustrating groundwater levels versus time, as compiled by the USGS (2014b), were selected for six monitor wells with longer periods of record and are shown on Figure 5-12.

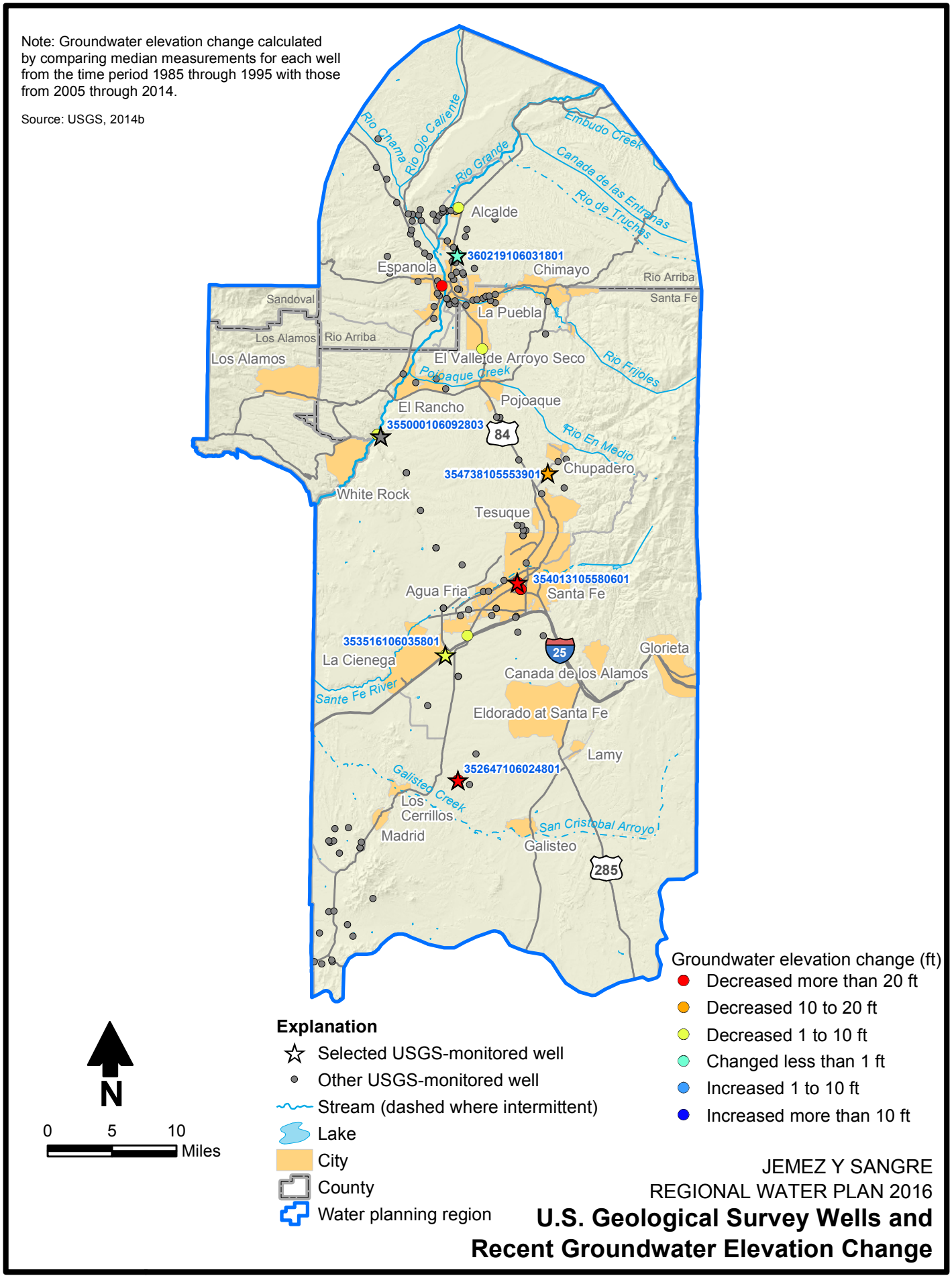
The aquifers in the planning region are generally recharged through mountain front recharge and stream losses. The accepted regional water plan provided estimates of recharge throughout the region (DBS&A and Lewis, 2003).

The major well fields in the planning region, along with the basins they draw from, are:

- The City of Santa Fe, which depends on both surface water and groundwater for its municipal water supply, diverts groundwater from both the Buckman well field and the City's well field centered on the western side of Santa Fe. The City began diverting water during the 1950s from its local well field. The St. Michael's well was added to the supply system in 1961, and the Buckman well field was added in 1972 and expanded in 2003. All of the City wells draw from the Santa Fe Group in the Española Basin. Reliance on the well fields eased substantially when the Buckman Direct Diversion Project was completed in 2011. As shown in Figure 5-12, the water level recovery in one monitoring well (355000106092803) near the Buckman well field was 175 feet over the past decade and another well (354013105580601) near the City well field shows a recovery of 20 feet. The aquifers are stratified, and recovery varies greatly depending on the depth of monitoring wells and production wells. For instance, the water level in Buckman well No 1 has risen over 500 feet since the year 2002 when other Buckman wells were drilled (City of Santa Fe, 2016).

- Los Alamos has three active well fields: the Guaje, Pajarito Mesa, and Otowi well fields. A fourth well field, Los Alamos well field, began production in 1947 and went out of service during 1993. The Guaje well field began production in 1950, and the Pajarito Mesa well field started operating in 1965; both are still active. The Otowi well field was added to the municipal supply system during 1993. Los Alamos wells withdraw from the regional aquifer in the Santa Fe Group.

- The City of Española well field began diverting groundwater in 1967 from the Española Basin.


Note: Groundwater elevation change calculated by comparing median measurements for each well from the time period 1985 through 1995 with those from 2005 through 2014.
Source: USGS, 2014b
Rio Chama
Rio Ojo Caliente
Rio Grande
Embudo Creek
Canada de las Entranas
Rio de Truchas
Alcalde
360219106031801
Espanola
Chimayo
Rio Arriba
Santa Fe
Sandoval
La Puebla
Los Alamos
Rio Arriba
Los Alamos
El Valle de Arroyo Seco
Rio Frijoles
Pojoaque Creek
El Rancho
Pojoaque
355000106092803
84
Rio En Medio
354738105553901
Chupadero
White Rock
Tesuque
354013105580601
Agua Fria
Santa Fe
353516106035801
25
Glorieta
La Cienega
Canada de los Alamos
Sante Fe River
Eldorado at Santa Fe
Lamy
352647106024801
Galisteo Creek
Los Cerrillos
San Cristobal Arroyo
Madrid
Galisteo
285
N
0
5
10
Miles
Explanation
Selected USGS-monitored well
Other USGS-monitored well
Stream (dashed where intermittent)
Lake
City
County
Water planning region
Groundwater elevation change (ft)
Decreased more than 20 ft
Decreased 10 to 20 ft
Decreased 1 to 10 ft
Changed less than 1 ft
Increased 1 to 10 ft
Increased more than 10 ft
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U.S. Geological Survey Wells and
Recent Groundwater Elevation Change
S:\PROJECTS\WR12.0165_STATE_WATER_PLAN_2012\GIS\MXDS\FIGURES_2016\JEMEZ_Y_SANGRE\FIG5-11_USGS_WELLS.MXD 6/11/2016

Figure 5-11

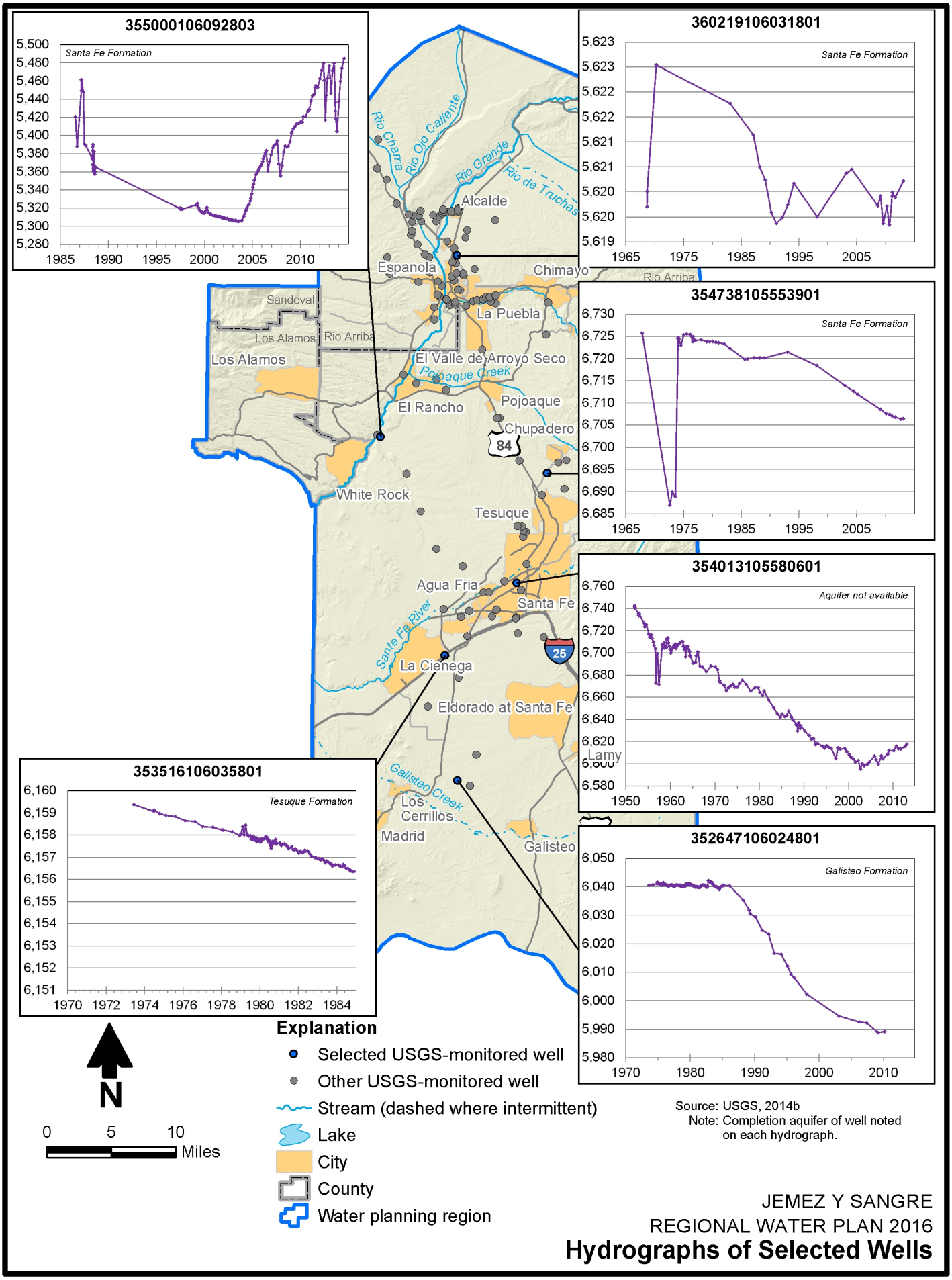
355000106092803
Santa Fe Formation
5,500
5,480
5,460
5,440
5,420
5,400
5,380
5,360
5,340
5,320
5,300
5,280
1985 1990 1995 2000 2005 2010
360219106031801
Santa Fe Formation
5,623
5,623
5,622
5,622
5,621
5,621
5,620
5,620
5,619
1965 1975 1985 1995 2005
354738105553901
Santa Fe Formation
6,730
6,725
6,720
6,715
6,710
6,705
6,700
6,695
6,690
6,685
1965 1975 1985 1995 2005
354013105580601
Aquifer not available
6,760
6,740
6,720
6,700
6,680
6,660
6,640
6,620
6,600
6,580
1950 1960 1970 1980 1990 2000 2010
352647106024801
Galisteo Formation
6,050
6,040
6,030
6,020
6,010
6,000
5,990
5,980
1970 1980 1990 2000 2010
353516106035801
Tesuque Formation
6,160
6,159
6,158
6,157
6,156
6,155
6,154
6,153
6,152
6,151
1970 1972 1974 1976 1978 1980 1982 1984
Rio Chama
Rio Ojo Caliente
Rio Grande
Rio de Truchas
Alcalde
Espanola
Chimayo
Rio Arriba
Sandoval
La Puebla
Los Alamos
Rio Arriba
Los Alamos
El Valle de Arroyo Seco
Pojoaque Creek
El Rancho
Pojoaque
Chupadero
84
White Rock
Tesuque
Agua Fria
Santa Fe
Sante Fe River
25
La Cienega
Eldorado at Santa Fe
Galisteo Creek
Los Cerrillos
Madrid
Galisteo
Lamy
N
0 5 10
Miles
Explanation
Selected USGS-monitored well
Other USGS-monitored well
Stream (dashed where intermittent)
Lake
City
County
Water planning region
Source: USGS, 2014b
Note: Completion aquifer of well noted on each hydrograph.
JEMEZ Y SANGRE
REGIONAL WATER PLAN 2016
Hydrographs of Selected Wells
S:\PROJECTS\WR12.0165_STATE_WATER_PLAN_2012\GIS\MXDS\FIGURES_2016\JEMEZ_Y_SANGRE\FIG5-12_USGS_WELLS_HYDROGRAPHS.MXD 6/11/2016

Figure 5-12

- The Eldorado community, south of Santa Fe, has its own small well field. Pumping from the Eldorado well field started in 1972 at a rate of 12 acre-feet per year (ac-ft/yr) and increased to about 500 ac-ft/yr in 1999. Wells in the Eldorado area obtain water from the Ancha and Tesuque formations (<100 feet thick), Espinaso and Galisteo formations (up to 1,000 feet thick), and Quaternary sediments (Galisteo Creek alluvium and shallow alluvium in San Marcos arroyo). Fractures within the Pennsylvanian Madera Formation and Precambrian crystalline rocks can also yield potable water to wells in the area.

- Several smaller communities and water systems, such as Santa Fe County, Cerillos, Galisteo, Lamy, Madrid, Velarde, and the pueblos of Ohkay Owingeh, Tesuque, Santa Clara, San Ildefonso, Pojoaque, and Nambe also have wells that tap shallow alluvial aquifers and the Santa Fe Group.

5.4 Water Quality

Assurance of ability to meet future water demands requires not only water in sufficient quantity, but also water that is of sufficient quality for the intended use. This section summarizes the water quality assessment that was provided in the accepted regional water plan and updates it to reflect new studies of surface and groundwater quality and current databases of contaminant sources. The identified water quality concerns should be a consideration in the selection of potential projects, programs, and policies to address the region's water resource issues.

Surface water quality in the Jemez y Sangre Water Planning Region is evaluated through periodic monitoring and comparison of sample results to pertinent water quality standards. Several reaches of rivers within the Rio Grande and Rio Chama watershed have been listed on the 2014-2016 New Mexico 303(d) list (NMED, 2014a). This list is prepared every two years by NMED and approved by the New Mexico Water Quality Control Commission (NMWQCC) to comply with Section 303(d) of the federal Clean Water Act, which requires each state to identify surface waters within its boundaries that do not meet water quality standards (see Section 4.2.2.1.1).

Section 303(d) further requires the states to prioritize their listed waters for development of total maximum daily load (TMDL) management plans, which document the amount of a pollutant a waterbody can assimilate without violating a state water quality standard and allocates that load capacity to known point sources and nonpoint sources at a given flow. Common causes of impairment in the Jemez y Sangre region include biological indicators, E. coli bacteria, nutrient/eutrophication, temperature, sediment/siltation/turbidity, and mercury in fish tissue. Figure 5-13 shows the locations of lakes and stream reaches included in the 303(d) list; Table 5-8 provides details of impairment for those reaches. As shown on Figure 5-13, all of the surface drainages flowing into the Rio Grande from the Los Alamos National Laboratory area are impaired.

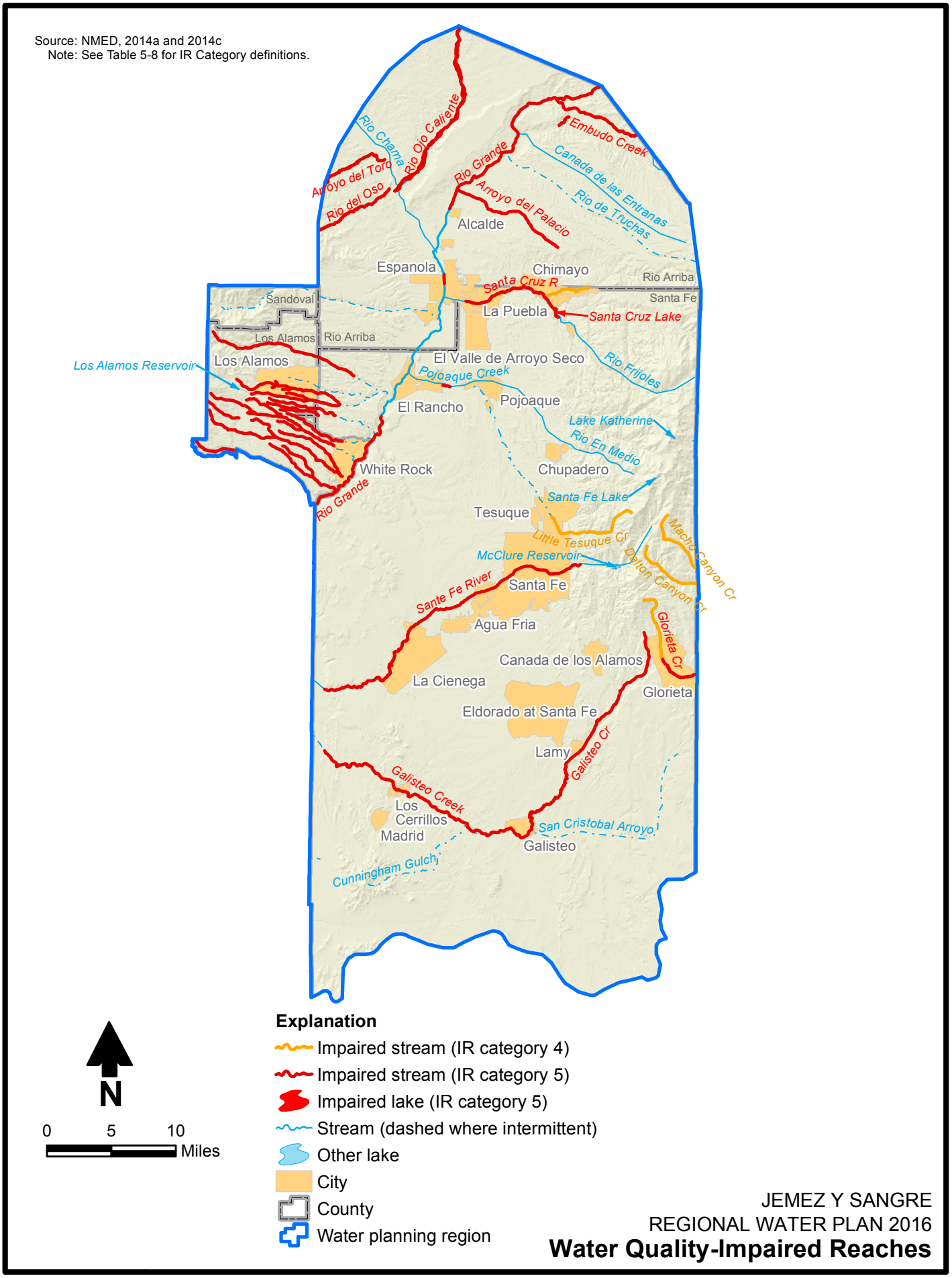
Source: NMED, 2014a and 2014c
Note: See Table 5-8 for IR Category definitions.
Rio Chama
Rio Ojo Caliente
Arroyo del Toro
Rio del Oso
Rio Grande
Embudo Creek
Canada de las Entranas
Rio de Truchas
Arroyo del Palacio
Alcalde
Espanola
Chimayo
Rio Arriba
Santa Fe
Santa Cruz R
Sandoval
La Puebla
Santa Cruz Lake
Los Alamos
Rio Arriba
Los Alamos Reservoir
Los Alamos
El Valle de Arroyo Seco
Rio Frijoles
Pojoaque Creek
El Rancho
Pojoaque
Lake Katherine
Rio En Medio
White Rock
Chupadero
Rio Grande
Santa Fe Lake
Tesuque
Little Tesuque Cr
Mechro Canyon Cr
McClure Reservoir
Dalton Canyon Cr
Sante Fe River
Santa Fe
Agua Fria
Glorieta Cr
Canada de los Alamos
La Cienega
Glorieta
Eldorado at Santa Fe
Lamy
Galisteo Cr
Galisteo Creek
Los Cerrillos
Madrid
San Cristobal Arroyo
Galisteo
Cunningham Gulch
N
0
5
10
Miles
Explanation
Impaired stream (IR category 4)
Impaired stream (IR category 5)
Impaired lake (IR category 5)
Stream (dashed where intermittent)
Other lake
City
County
Water planning region
JEMEZ Y SANGRE
REGIONAL WATER PLAN 2016
Water Quality-Impaired Reaches
S:\PROJECTS\WR12.0165_STATE_WATER_PLAN_2012\GIS\MXDS\FIGURES_2016\JEMEZ_Y_SANGRE\FIG5-13_WQ_IMPAIRED_REACHES.MXD 6/11/2016

Figure 5-13

Table 5-8. Total Maximum Daily Load Status of Streams in the Jemez y Sangre Water Planning Region

Waterbody Name [a] (basin, segment)	Assessment Unit ID	Affected Reach (miles [b])	Probable Sources of Pollutant	Uses Not Fully Supported [c]	Specific Pollutant	IR Category [d]
Rio Arriba County						
Arroyo del Palacio (Rio Grande to headwaters)	NM-98.A_004	9.86	Source unknown	MWWAL	PCB in water column	5/5A
Arroyo del Toro (Rio Chama to headwaters)	NM-98.A_006	6.85	Source unknown	MWWAL	PCB in water column	5/5A
Canada Aqua (Arroyo La Mina to headwaters)	NM-98.A_003	1.15	Source unknown	MWWAL	PCB in water column	5/5A
Embudo Creek (Canada de Ojo Sarco to Picuris Pueblo bnd)	NM-2111_40	5.07	Source unknown	MCWAL WWAL	Nutrient/eutrophication Biological indicators	5/5C
Embudo Creek (Rio Grande to Canada de Ojo Sarco)	NM-2111_41	6.19	Site clearance (new development or infill) Channelization Dredging for navigation channels Source unknown Loss of riparian habitat Off-road vehicles Rangeland grazing Streambank modifications/destabilization Natural sources	MCWAL	Sedimentation/siltation Temperature, water Turbidity	5/5A
Rio del Oso (Perennial prt Rio Chama to headwaters)	NM-2112.A_10	16.88	Source unknown	HQColdWAL	PCB in water column	5/5A
Rio Grande (Embudo Creek to Rio Pueblo de Taos)	NM-2111_12	15.19	Source unknown	MCWAL	Turbidity	5/5C
Rio Grande (Ohkay Owingeh bnd to Embudo Creek)	NM-2111_10	14.53	Source unknown Irrigated crop production Loss of riparian habitat Road/bridge runoff Natural sources Rangeland grazing	WWAL MCWAL	PCB in fish tissue Turbidity	5/5C

Source: NMED, 2014a

[a] Only waterbodies assigned to IR categories 3 and above are included.

[b] Unless otherwise noted.

[c] Explanation of uses abbreviations provided at the end of this table

[d] Impairment (IR) category definitions are attached as the last page of this table.

[e] Acres

— = No information provided (reach was not assessed).

Table 5-8. Total Maximum Daily Load Status of Streams in the Jemez y Sangre Water Planning Region

Waterbody Name [a] (basin, segment)	Assessment Unit ID	Affected Reach (miles [b])	Probable Sources of Pollutant	Uses Not Fully Supported [c]	Specific Pollutant	IR Category [d]
Rio Arriba County (cont.)						
Rio Grande (Santa Clara Pueblo bnd to Ohkay Owingeh bnd)	NM-2111_11	0.7	Source unknown Irrigated crop production Loss of riparian habitat Road/bridge runoff Natural sources Rangeland grazing	MCWAL WWAL	PCB in fish tissue Turbidity	5/5C
Rio Ojo Caliente (Rio Chama to Rio Vallecitos)	NM-2113_10	34.91	Source unknown	WWAL ColdWAL	Nutrient/eutrophication Biological indicators	5/5C
Rio Quemado (Rio Arriba Cnty bnd to headwaters)	NM-2120.A_120	11.09	Not assessed	—	—	3/3A
Rio Quemado (Santa Cruz River to Rio Arriba Cnty bnd)	NM-2118.A_52	3.84	Low water crossing Waterfowl Livestock (grazing or feeding operations) On-site treatment systems (septic) Recreational pollution sources Wildlife other than waterfowl Wastes from pets Impervious surface/parking lot runoff Road/bridge runoff Inappropriate waste disposal Rangeland grazing	PC	Escherichia coli	4A
Santa Cruz River (Santa Clara Pueblo bnd to Santa Cruz Dam)	NM-2111_50	8.25	Livestock (grazing or feeding operations) Source unknown Road/bridge runoff Streambank modifications/destabilization	MCWAL PC	Escherichia coli Temperature, water	5/5A

Source: NMED, 2014a

[a] Only waterbodies assigned to IR categories 3 and above are included.

[b] Unless otherwise noted.

[c] Explanation of uses abbreviations provided at the end of this table

[d] Impairment (IR) category definitions are attached as the last page of this table.

[e] Acres

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Table 5-8. Total Maximum Daily Load Status of Streams in the Jemez y Sangre Water Planning Region

Waterbody Name [a] (basin, segment)	Assessment Unit ID	Affected Reach (miles [b])	Probable Sources of Pollutant	Uses Not Fully Supported [c]	Specific Pollutant	IR Category [d]
Los Alamos County						
Acid Canyon (Pueblo to headwaters)	NM-97.A_002	0.36	Source unknown	WH LW MWWAL	Aluminum Copper, acute Copper, chronic Gross alpha PCB in water column	5/5C
Ancho Canyon (North Fork to headwaters)	NM-9000.A_046	4.42	Source unknown	LAL	PCB in water column	5/5A
Ancho Canyon (Rio Grande to North Fork Ancho)	NM-9000.A_054	2.39	Source unknown	LW LAL WH	Aluminum Gross alpha PCB in water column	5/5C
Arroyo de la Delfe (Pajarito Canyon to headwaters)	NM-128.A_16	0.61	Source unknown	LAL LW	Aluminum Gross alpha	5/5C
Bayo Canyon (San Ildefonso bnd to headwaters)	NM-97.A_007	5.81	Not assessed	—	—	3/3A
Canada del Buey (San Ildefonso Pueblo to LANL bnd)	NM-9000.A_053	1.65	Not assessed	—	—	3/3A
Canada del Buey (within LANL)	NM-128.A_00	5.11	Source unknown	LW LAL	Aluminum Gross alpha PCB in water column	5/5A
Canon de Valle (below LANL gage E256)	NM-128.A_01	2.41	Source unknown	LW LAL	Aluminum Gross alpha	5/5C
Canon de Valle (LANL gage E256 to Burning Ground Spr)	NM-126.A_00	0.29	Source unknown	LW ColdWAL WH	Aluminum Gross alpha PCB in water column	5/5C

Source: NMED, 2014a

[a] Only waterbodies assigned to IR categories 3 and above are included.

[b] Unless otherwise noted.

[c] Explanation of uses abbreviations provided at the end of this table

[d] Impairment (IR) category definitions are attached as the last page of this table.

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— = No information provided (reach was not assessed).

Table 5-8. Total Maximum Daily Load Status of Streams in the Jemez y Sangre Water Planning Region

Waterbody Name [a] (basin, segment)	Assessment Unit ID	Affected Reach (miles [b])	Probable Sources of Pollutant	Uses Not Fully Supported [c]	Specific Pollutant	IR Category [d]
Los Alamos County (cont.)						
Canon de Valle (upper LANL bnd to headwaters)	NM-9000.A_051	3.56	Source unknown	MWWAL LW	Aluminum Gross alpha PCB in water column	5/5C
Canon de Valle (within LANL above Burning Ground Spr)	NM-128.A_02	1.03	Not assessed	—	—	3/3A
DP Canyon (Los Alamos Canyon to LANL bnd)	NM-128.A_10	1.83	Source unknown	LW LAL WH	Aluminum Gross alpha PCB in water column	5/5C
Fence Canyon (above Potrillo Canyon)	NM-128.A_04	2.92	Not assessed	—	—	3/3A
Graduation Canyon (Pueblo Canyon to headwaters)	NM-97.A_005	0.71	Source unknown	WH MWWAL	Aluminum Copper, acute PCB in water column	5/5C
Guaje Canyon (San Ildefonso bnd to headwaters)	NM-9000.A_005	12.33	Source unknown	MWWAL	Aluminum	5/5C
Indio Canyon (above Water Canyon)	NM-128.A_05	1.18	Not assessed	—	—	3/3A
Kwage Canyon (Pueblo Canyon to headwaters)	NM-97.A_003	1.18	Not assessed	—	—	3/3B
Los Alamos Canyon (DP Canyon to upper LANL bnd)	NM-9000.A_063	4.58	Source unknown	LAL WH LW	Aluminum Gross alpha Mercury PCB in water column	5/5C
Los Alamos Canyon (NM-4 to DP Canyon)	NM-9000.A_006	2.59	Source unknown	LW LAL WH	Aluminum Gross alpha PCB in water column	5/5C

Source: NMED, 2014a

[a] Only waterbodies assigned to IR categories 3 and above are included.

[b] Unless otherwise noted.

[c] Explanation of uses abbreviations provided at the end of this table

[d] Impairment (IR) category definitions are attached as the last page of this table.

[e] Acres

— = No information provided (reach was not assessed).

Table 5-8. Total Maximum Daily Load Status of Streams in the Jemez y Sangre Water Planning Region

Waterbody Name [a] (basin, segment)	Assessment Unit ID	Affected Reach (miles [b])	Probable Sources of Pollutant	Uses Not Fully Supported [c]	Specific Pollutant	IR Category [d]
Los Alamos County (cont.)						
Los Alamos Canyon (upper LANL bnd to Los Alamos Rsvr)	NM-9000.A_049	0.97	Not assessed	—	—	3/3A
Los Alamos Reservoir	NM-9000.B_077	2 [e]	Not assessed	—	—	3/3A
Mortandad Canyon (within LANL)	NM-9000.A_042	4.25	Source unknown	LW WH LAL	Aluminum Copper, acute Copper, chronic Gross alpha PCB in water column	5/5C
North Fork Ancho Canyon (Ancho Canyon to headwaters)	NM-9000.A_055	3.73	Source unknown	LAL WH LW	Gross alpha PCB in water column	5/5C
Pajarito Canyon (Arroyo de La Delfe to Starmers Spring)	NM-126.A_01	0.52	Source unknown	ColdWAL	Aluminum	5/5C
Pajarito Canyon (upper LANL bnd to headwaters)	NM-9000.A_048	2.54	Source unknown	WH LW MWWAL	Aluminum Arsenic Gross alpha PCB in water column Selenium, total recoverable	5/5C
Pajarito Canyon (within LANL above Starmers Gulch)	NM-128.A_07	1.11	Source unknown	WH LAL	Aluminum Gross alpha	5/5C
Pajarito Canyon (within LANL below Arroyo de La Delfe)	NM-128.A_08	6.92	Source unknown	LAL	Aluminum PCB in water column	5/5C
Potrillo Canyon (above Water Canyon)	NM-128.A_09	6.25	Source unknown	LAL LW	Aluminum Gross alpha	5/5C

Source: NMED, 2014a

[a] Only waterbodies assigned to IR categories 3 and above are included.

[b] Unless otherwise noted.

[c] Explanation of uses abbreviations provided at the end of this table

[d] Impairment (IR) category definitions are attached as the last page of this table.

[e] Acres

— = No information provided (reach was not assessed).

Table 5-8. Total Maximum Daily Load Status of Streams in the Jemez y Sangre Water Planning Region

Waterbody Name [a] (basin, segment)	Assessment Unit ID	Affected Reach (miles [b])	Probable Sources of Pollutant	Uses Not Fully Supported [c]	Specific Pollutant	IR Category [d]
Los Alamos County (cont.)						
Pueblo Canyon (Acid Canyon to headwaters)	NM-9000.A_043	3.59	Source unknown	MWWAL LW WH	Aluminum Gross apha PCB in water column	5/5C
Pueblo Canyon (Los Alamos Canyon to Los Alamos WWTP)	NM-99.A_001	2.31	Source unknown	WH LW MWWAL	Aluminum Gross alpha PCB in water column	5/5C
Pueblo Canyon (Los Alamos WWTP to Acid Canyon)	NM-97.A_006	3.28	Source unknown	WH LW MWWAL	Gross alpha PCB in water column	5/5C
Rendija Canyon (Guaje Canyon to headwaters)	NM-9000.A_045	8.1	Not assessed	—	—	3/3A
Rio Grande (Cochiti Reservoir to San Ildefonso bnd)	NM-2111_00	22.68	Source unknown	WWAL PC LW MCWAL	Escherichia coli Gross alpha PCB in fish tissue PCB in water column Turbidity	5/5C
Rito de los Frijoles (Rio Grande to Upper Crossing)	NM-2118.A_70	7.99	Source unknown	HQColdWAL	Aluminum DDT	5/5A
Rito de los Frijoles (Upper Crossing to headwaters)	NM-2118.A_74	6.01	Source unknown	HQColdWAL	Aluminum	5/5A
Sandia Canyon (Sigma Canyon to NPDES outfall 001)	NM-9000.A_047	2.22	Source unknown	WH ColdWAL LW	Aluminum Copper, acute Gross alpha PCB in water column Thallium	5/5C

Source: NMED, 2014a

[a] Only waterbodies assigned to IR categories 3 and above are included.

[b] Unless otherwise noted.

[c] Explanation of uses abbreviations provided at the end of this table

[d] Impairment (IR) category definitions are attached as the last page of this table.

[e] Acres

— = No information provided (reach was not assessed).

Table 5-8. Total Maximum Daily Load Status of Streams in the Jemez y Sangre Water Planning Region

Waterbody Name [a] (basin, segment)	Assessment Unit ID	Affected Reach (miles [b])	Probable Sources of Pollutant	Uses Not Fully Supported [c]	Specific Pollutant	IR Category [d]
Los Alamos County (cont.)						
Sandia Canyon (within LANL below Sigma Canyon)	NM-128.A_11	3.46	Source unknown	LAL LW WH	Aluminum Gross alpha PCB in water column	5/5C
South Fork Acid Canyon (Acid Canyon to headwaters)	NM-97.A_029	0.2	Source unknown	WH LW MWWAL	Copper, acute Gross alpha PCB in water column Zinc, acute	5/5A
Ten Site Canyon (Mortandad Canyon to headwaters)	NM-128.A_17	1.53	Source unknown	LAL LW WH	Aluminum Gross alpha PCB in water column	5/5C
Three Mile Canyon (Pajarito Canyon to headwaters)	NM-9000.A_091	2.2	Source unknown	LW LAL	Aluminum Gross alpha	5/5C
Two Mile Canyon (Pajarito to headwaters)	NM-128.A_15	3.36	Source unknown	LAL WH LW	Aluminum Gross alpha PCB in water column	5/5C
Walnut Canyon (Pueblo Canyon to headwaters)	NM-97.A_004	0.38	Source unknown	MWWAL	Copper, acute PCB in water column	5/5C
Water Canyon (Area-A Canyon to NM 501)	NM-126.A_03	1.26	Not assessed	—	Aluminum	5/5C
Water Canyon (Rio Grande to lower LANL bnd)	NM-9000.A_044	0.54	Not assessed	—	—	3/3A
Water Canyon (upper LANL bnd to headwaters)	NM-9000.A_052	2.86	Source unknown	MWWAL	Aluminum	5/5C
Water Canyon (within LANL above NM 501)	NM-128.A_12	0.04	Not assessed	—	—	3/3A

Source: NMED, 2014a

[a] Only waterbodies assigned to IR categories 3 and above are included.

[b] Unless otherwise noted.

[c] Explanation of uses abbreviations provided at the end of this table

[d] Impairment (IR) category definitions are attached as the last page of this table.

[e] Acres

— = No information provided (reach was not assessed).

Table 5-8. Total Maximum Daily Load Status of Streams in the Jemez y Sangre Water Planning Region

Waterbody Name [a] (basin, segment)	Assessment Unit ID	Affected Reach (miles [b])	Probable Sources of Pollutant	Uses Not Fully Supported [c]	Specific Pollutant	IR Category [d]
Los Alamos County (cont.)						
Water Canyon (within LANL below Area-A Cyn)	NM-128.A_13	8.59	Source unknown	LAL WH LW	Aluminum Gross alpha PCB in water column	5/5C
Santa Fe County						
Alamo Creek (Cienega Creek to headwaters)	NM-2110_20	6.48	Not assessed	—	—	3/3A
Ancho Canyon (Rio Grande to North Fork Ancho)	NM-9000.A_054	2.39	Source unknown	LW LAL WH	Aluminum Gross alpha PCB in water column	5/5C
Apache Cny (perennial prt Galisteo Ck to hdwts)	NM-2118.A_14	9.7	Not assessed	—	—	3/3A
Bayo Canyon (San Ildefonso bnd to headwaters)	NM-97.A_007	5.81	Not assessed	—	—	3/3A
Canada del Buey (San Ildefonso Pueblo to LANL bnd)	NM-9000.A_053	1.65	Not assessed	—	—	3/3A
Canada del Buey (within LANL)	NM-128.A_00	5.11	Source unknown	LW LAL	Aluminum Gross alpha PCB in water column	5/5A
Cunningham Gulch (CR 55 to above mine area)	NM-97.A_011	1.4	Not assessed	—	—	3/3A
Dalton Canyon Creek (Perennial prt Pecos R to headwaters)	NM-2214.A_070	8.02	Recreational pollution sources Drought-related impacts Impervious surface/parking lot runoff Road/bridge runoff Watershed runoff following forest fire Inappropriate waste disposal	HQColdWAL	Specific conductance	4A

Source: NMED, 2014a

[a] Only waterbodies assigned to IR categories 3 and above are included.

[b] Unless otherwise noted.

[c] Explanation of uses abbreviations provided at the end of this table

[d] Impairment (IR) category definitions are attached as the last page of this table.

[e] Acres

— = No information provided (reach was not assessed).

Table 5-8. Total Maximum Daily Load Status of Streams in the Jemez y Sangre Water Planning Region

Waterbody Name [a] (basin, segment)	Assessment Unit ID	Affected Reach (miles [b])	Probable Sources of Pollutant	Uses Not Fully Supported [c]	Specific Pollutant	IR Category [d]
Santa Fe County (cont.)						
Deer Ck (perennial prt Galisteo Ck to hdwts)	NM-2118.A_13	5.5	Not assessed	—	—	3/3A
Galisteo Ck (Perennial prt 2.2 mi abv Lamy to hdwts)	NM-2118.A_12	10	Not assessed	—	—	3/3A
Galisteo Ck (Perennial prt Kewa bnd to 2.2 mi abv Lamy)	NM-2118.A_10	33.5	Source unknown	CoolWAL	Temperature, water	5/5C
Glorieta Ck (Perennial prt Glorieta CC WWTP to headwaters)	NM-2214.A_082	5.95	Not assessed	HQColdWAL	Low flow alterations	4C
Glorieta Ck (Perennial prt Pecos R to Glorieta CC WWTP)	NM-2214.A_081	8.39	Source unknown	HQColdWAL	Nutrient/eutrophication Biological indicators Specific conductance	5/5B
Guaje Canyon (San Ildefonso bnd to headwaters)	NM-9000.A_005	12.33	Source unknown	MWWAL	Aluminum	5/5C
Johnson Lake	NM-2214.B_10	2.5 [e]	Not assessed	—	—	3/3A
Lake Katherine	NM-2214.B_20	11.8 [e]	Not assessed	—	—	3/3A
Little Tesuque Creek (Rio Tesuque to headwaters)	NM-2118.A_34	8.28	Natural sources	HQColdWAL	Aluminum	4A
Los Alamos Canyon (NM-4 to DP Canyon)	NM-9000.A_006	2.59	Source unknown	LW LAL WH	Aluminum Gross alpha PCB in water column	5/5C
Los Alamos Canyon (San Ildefonso bnd to NM-4)	NM-9000.A_000	0.93	Not assessed	—	—	3/3A

Source: NMED, 2014a

[a] Only waterbodies assigned to IR categories 3 and above are included.

[b] Unless otherwise noted.

[c] Explanation of uses abbreviations provided at the end of this table

[d] Impairment (IR) category definitions are attached as the last page of this table.

[e] Acres

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Table 5-8. Total Maximum Daily Load Status of Streams in the Jemez y Sangre Water Planning Region

Waterbody Name [a] (basin, segment)	Assessment Unit ID	Affected Reach (miles [b])	Probable Sources of Pollutant	Uses Not Fully Supported [c]	Specific Pollutant	IR Category [d]
Santa Fe County (cont.)						
Macho Canyon Creek (Pecos River to headwaters)	NM-2214.A_071	7.82	Channelization On-site treatment systems (septic) Wildlife other than waterfowl Drought-related iimpacts Impervious surface/parking lot runoff Road/bridge runoff Rangeland grazing Rural (residential areas) Streambank modifications/destabilization	HQColdWAL	Specific conductance	4A
McClure Reservoir	NM-2118.B_50	75.83 [e]	Not assessed	—	—	3/3A
Mortandad Canyon (within LANL)	NM-9000.A_042	4.25	Source unknown	LW WH LAL	Aluminum Copper, acute Copper, chronic Gross alpha PCB in water column	5/5C
Nambe Lake	NM-2118.B_10	1.6 [e]	Not assessed	—	—	3/3A
Nichols Reservoir	NM-2118.B_40	28.69 [e]	Not assessed	—	—	3/3A
Pojoaque River (San Ildefonso bnd to Pojoaque bnd)	NM-2111_20	0.61	Source unknown	WWAL MCWAL	PCB in water column	5/5A
Pueblo Canyon (Los Alamos Canyon to Los Alamos WWTP)	NM-99.A_001	2.31	Source unknown	WH LW MWWAL	Aluminum Gross alpha PCB in water column	5/5C
Rendija Canyon (Guaje Canyon to headwaters)	NM-9000.A_045	8.1	Not assessed	—	—	3/3A
Rio en Medio (Aspen Ranch to headwaters)	NM-2118.A_42	0.93	Not assessed	—	—	3/3A

Source: NMED, 2014a

[a] Only waterbodies assigned to IR categories 3 and above are included.

[b] Unless otherwise noted.

[c] Explanation of uses abbreviations provided at the end of this table

[d] Impairment (IR) category definitions are attached as the last page of this table.

[e] Acres

— = No information provided (reach was not assessed).

Table 5-8. Total Maximum Daily Load Status of Streams in the Jemez y Sangre Water Planning Region

Waterbody Name [a] (basin, segment)	Assessment Unit ID	Affected Reach (miles [b])	Probable Sources of Pollutant	Uses Not Fully Supported [c]	Specific Pollutant	IR Category [d]
Santa Fe County (cont.)						
Rio Grande (Cochiti Reservoir to San Ildefonso bnd)	NM-2111_00	22.68	Source unknown	WWAL PC LW MCWAL	Escherichia coli Gross alpha PCB in fish tissue PCB in water column Turbidity	5/5C
Rio Quemado (Santa Cruz River to Rio Arriba Cnty bnd)	NM-2118.A_52	3.84	Low water crossing Waterfowl Livestock (grazing or feeding operations) On-site treatment systems (septic) Recreational pollution sources Wildlife other than waterfowl Wastes from pets Impervious surface/parking lot runoff Road/bridge runoff Inappropriate waste disposal Rangeland grazing	PC	Escherichia coli	4A
San Cristobal Creek (Galisteo Creek to headwaters)	NM-2118.A_11	13.85	Not assessed	—	—	3/3A
Sandia Canyon (within LANL below Sigma Canyon)	NM-128.A_11	3.46	Source unknown	LAL LW WH	Aluminum Gross alpha PCB in water column	5/5C
Santa Cruz Lake	NM-2118.B_00	100.81 [e]	Source unknown	HQColdWAL	Temperature, water	5/5A
Santa Cruz River (San Clara Pueblo bnd to Santa Cruz Dam)	NM-2111_50	8.25	Livestock (grazing or feeding operations) Source unknown Road/bridge runoff Streambank modifications/destabilization	MCWAL PC	Escherichia coli Temperature, water	5/5A
Santa Fe Lake	NM-2118.B_30	4.9 [e]	Not assessed	—	—	3/3A

Source: NMED, 2014a

[a] Only waterbodies assigned to IR categories 3 and above are included.

[b] Unless otherwise noted.

[c] Explanation of uses abbreviations provided at the end of this table

[d] Impairment (IR) category definitions are attached as the last page of this table.

[e] Acres

— = No information provided (reach was not assessed).

Table 5-8. Total Maximum Daily Load Status of Streams in the Jemez y Sangre Water Planning Region

Waterbody Name [a] (basin, segment)	Assessment Unit ID	Affected Reach (miles [b])	Probable Sources of Pollutant	Uses Not Fully Supported [c]	Specific Pollutant	IR Category [d]
Santa Fe County (cont.)						
Santa Fe River (Cochiti Pueblo bnd to Paseo del Canon)	NM-2110_02	7.62	Source unknown	CoolWAL	Nutrient/eutrophication Biological indicators Sedimentation/siltation	5/5A
Santa Fe River (Guadalupe St to Nichols Rsv)	NM-9000.A_062	10	Not assessed	—	—	3/3A
Santa Fe River (Paseo del Canon to Santa Fe WWTP)	NM-2110_00	4.6	Source unknown	CoolWAL	Nutrient/eutrophication Biological indicators	5/5A
Santa Fe River (Santa Fe WWTP to Guadalupe St)	NM-9000.A_061	10	Source unknown	PC LAL WH	Aluminum Escherichia coli PCB in water column	5/5A
Spirit Lake	NM-2214.B_80	2.9 [e]	Not assessed	—	—	3/3A
Stewart Lake	NM-2214.B_70	4.2 [e]	Not assessed	—	—	3/3A
Unnamed tributary (Arroyo Hondo to Oshara outfall)	NM-97.A_012	0.4	Not assessed	—	—	3/3A
Water Canyon (Rio Grande to lower LANL bnd)	NM-9000.A_044	0.54	Not assessed	—	—	3/3A

Source: NMED, 2014a

[a] Only waterbodies assigned to IR categories 3 and above are included.

[b] Unless otherwise noted.

[c] ColdWAL = Coldwater aquatic life
Cool WAL = Coolwater aquatic life
HQColdWAL = High quality coldwater aquatic life
LAL = Limited aquatic life
LW = Livestock watering
MCWAL = Marginal coldwater aquatic life
MWWAL = Marginal warmwater aquatic life
PC = Primary contact
WH = Wildlife habitat
WWAL = Warm water aquatic life

[d] Impairment (IR) category definitions are attached as the last page of this table.

[e] Acres

— = No information provided (reach was not assessed).

Table 5-8. Total Maximum Daily Load Status of Streams in the Jemez y Sangre Water Planning Region

[d] Impairment (IR) categories are determined for each assessment unit (AU) by combining individual designated use support decisions.
The applicable unique assessment categories for New Mexico (NMED, 2013b) are described as follows:

Category 3: No reliable monitored data and/or information to determine if any designated or existing use is attained. AUs are listed in this category where data to support an attainment determination for any use are not available, consistent with requirements of the assessment and listing methodology.

Category 3A: Limited data (n = 0 to 1) available, no exceedences. AUs are listed in this subcategory when there are no exceedences in the limited data set. These are considered low priority for follow up monitoring (NMED, 2013).

Category 3B: Limited data (n = 1) available, exceedence. AUs are listed in this subcategory when there is an exceedence in the limited data set. These are considered high priority for follow up monitoring (NMED, 2013)..

Category 4A: Impaired for one or more designated uses, but does not require development of a TMDL because TMDL has been completed. AUs are listed in this subcategory once all TMDL(s) have been developed and approved by USEPA that, when implemented, are expected to result in full attainment of the standard. Where more than one pollutant is associated with the impairment of an AU, the AU remains in IR Category 5A (see below) until all TMDLs for each pollutant have been completed and approved by USEPA.

Category 4C: Impaired for one or more designated uses, but does not require development of a TMDL because impairment is not caused by a pollutant. AUs are listed in this subcategory if a pollutant does not cause the impairment. For example, USEPA considers flow alteration to be “pollution” vs. a “pollutant.”

Category 5/5A: Impaired for one or more designated or existing uses and a TMDL is underway or scheduled. AUs are listed in this category if the AU is impaired for one or more designated uses by a pollutant. Where more than one pollutant is associated with the impairment of a single AU, the AU remains in IR Category 5A until TMDLs for all pollutants have been completed and approved by USEPA.

Category 5/5B: Impaired for one or more designated or existing uses and a review of the water quality standard will be conducted. AUs are listed in this category when it is possible that water quality standards are not being met because one or more current designated use is inappropriate. After a review of the water quality standard is conducted, a Use Attainability Analysis (UAA) will be developed and submitted to USEPA for consideration, or the AU will be moved to IR Category 5A and a TMDL will be scheduled.

Category 5/5C: Impaired for one or more designated or existing uses and additional data will be collected before a TMDL is scheduled. AUs are listed in this category if there is not enough data to determine the pollutant of concern or there is not adequate data to develop a TMDL. For example, AUs with biological impairment will be listed in this category until further research can determine the particular pollutant(s) of concern. When the pollutant(s) are determined, the AU will be moved to IR Category 5A and a TMDL will be scheduled. If it is determined that the current designated uses are inappropriate, it will be moved to IR Category 5B and a UAA will be developed. If it is determined that “pollution” is causing the impairment (vs. a “pollutant”), the AU will be moved to IR Category 4C.

In evaluating the impacts of the 303(d) list on the regional water planning process, it is important to consider that impairments are tied to designated uses. Some problems can be very disruptive to a healthy aquatic community, while others reduce the safety of water recreation or increase the risk of fish consumption. Impairments will not necessarily make the water unusable for irrigation or even for domestic water supply, but the water may need treatment prior to use and the costs of this should be recognized.

Generally the quality of groundwater in the planning region is good, though there are some issues with naturally occurring arsenic and uranium and some instances of elevated nitrate due to septic impacts (DBS&A and Lewis, 2003).

Several types and sources of contaminants that have the potential to impact either surface or groundwater quality are discussed below. Sources of contamination are considered as one of two types: (1) point sources, if they originate from a single location, or (2) nonpoint sources, if they originate over a more widespread or unspecified location. Information on both types of sources is provided below.

5.4.1 Potential Sources of Contamination to Surface and Groundwater

Specific sources that have the potential to impact either surface or groundwater quality in the future are discussed below. These include municipal and industrial sources, leaking underground storage tanks, landfills, and nonpoint sources.

5.4.1.1 Municipal and Industrial Sources

As discussed in Section 4.2.2, a person or facility that discharges a pollutant from a point source to a surface water that is a water of the United States must obtain an NPDES permit. An NPDES permit must assure compliance with the New Mexico Water Quality Standards. A person or facility that discharges contaminants that may move into groundwater must obtain a groundwater discharge permit from the New Mexico Environment Department. A groundwater discharge permit ensures compliance with New Mexico groundwater quality standards. The NMWQCC regulations also require abatement of groundwater contamination that exceeds standards.

NPDES-permitted discharges in the planning region are summarized in Table 5-9 and shown on Figure 5-14; details regarding NPDES permits in New Mexico are available on the NMED's website (http://www.nmenv.state.nm.us/swqb/Permits/). Most of the permits in the region are for municipal or private wastewater treatment plant discharges.

A summary list of current groundwater discharge permits in the planning region is provided in Table 5-10; their locations are shown in Figure 5-14. Details indicating the status, waste type, and treatment for discharge permits for industrial and domestic waste can be obtained from the NMED Ground Water Quality Bureau website (https://www.env.nm.gov/gwb/NMED-GWQB-PollutionPrevention.htm#PPSlist).

Table 5-9. Municipal and Industrial NPDES Permittees in the Jemez y Sangre Water Planning Region

Permit No	Municipality/Industry [a]	Permit Type [b]
Rio Arriba County		
NM0029351	Espanola, City of [c]	Municipal (POTW)
Los Alamos County		
NM0020141	Los Alamos County/Los Alamos Wastewater Treatment Facility [c]	Municipal (POTW)
NM0020133	Los Alamos County/White Rock	Municipal (POTW)
NM0028355	USDOE Los Alamos Nat Labs [c,d]	Federal
NM0031054	USDOE Los Alamos Nat Labs -Springs	—
Santa Fe County		
NM0030848	Buckman Direct Diversion Project	Utility
NM0030694	Four Corners Water Reclamation Facility	Municipal (POTW)
NM0028088	Glorieta Camps WWTP	Private domestic
NM0028711	LAC Minerals Inc	Mine (non-coal)
NM0030813	Oshara Village Water Reclamation Facility	
NM0028436	Pojoaque Terraces Mobile Home Park	
NM0030368	Ranchland Utility Company	Private domestic
NM0022292	Santa Fe, City of/WWTP [c]	Municipal (POTW)
NM0030601	Towa Resort, Pueblo of Pojoaque	Native American (domestic)
NM0030759	USDOE Los Alamos Nat Labs - Storm Water	Federal

Source: NMED, 2016c

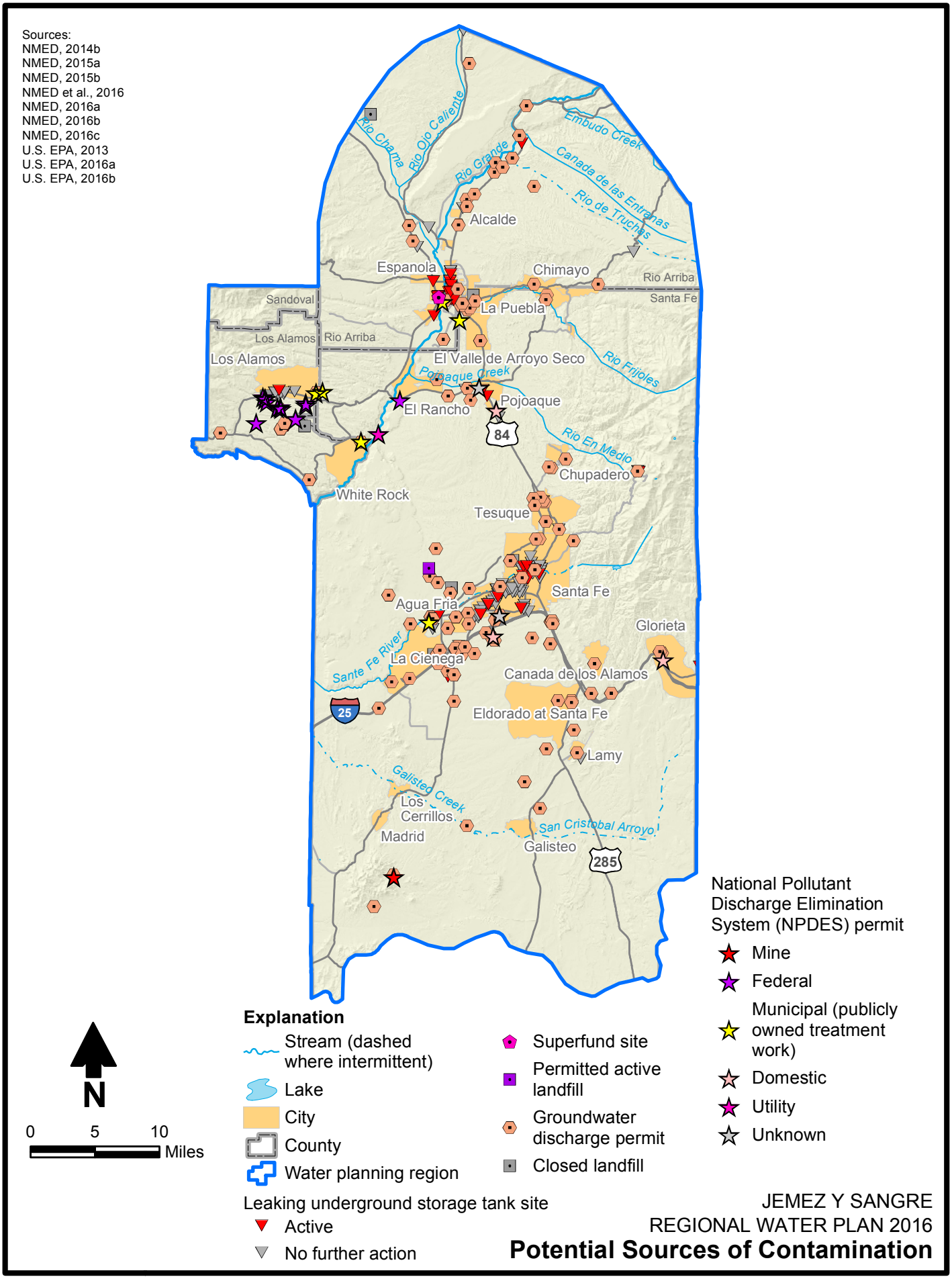
[a] Names appear as listed in the NMED database.

[b] Facilities and activities covered under the 2015 U.S. EPA NPDES Multi-Sector General Permit (MSGP) for Stormwater Discharges Associated with Industrial Activity (e.g., mining, timber products, scrap recycling facilities, as listed in Appendix D of the MSGP [U.S. EPA, 2015]) are not included due to the large number of facilities.

[c] Major discharger, classified as such by the Regional Administrator, or in the case of approved state programs, the Regional Administrator in conjunction with the State Director. Major municipal dischargers include all facilities with design flows of greater than 1 million gallons per day and facilities with U.S. EPA/State approved industrial pretreatment programs. Major industrial facilities are determined based on specific ratings criteria developed by U.S. EPA/State.

[d] NMED lists multiple outfall locations

NPDES = National Pollutant Discharge and Elimination System
POTW = Publicly owned treatment works
USDOE = U.S. Department of Energy
WWTP = Wastewater treatment plant
U.S. EPA = U.S. Environmental Protection Agency



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JEMEZ Y SANGRE
REGIONAL WATER PLAN 2016

Potential Sources of Contamination

Figure 5-14

Table 5-10. Groundwater Discharge Permits in the Jemez y Sangre Water Planning Region

County	Facility Name [a]	Permit No.	Status [b]	Permitted Discharge Amount (gpd)
Rio Arriba	Bienvenidos Resort	DP-739	Active	3,000
	Buena Vista Mobile Home Park	DP-1616	Pending	—
	Chimayo Elementary School	DP-1453	Active	9,000
	Cordova Mutual Domestic Water Consumers Association	DP-1548	Active	8,100
	Delancey Street	DP-223	Active	12,000
	Embudo Station	DP-1761	Active	4,000
	Enchanted Mesa Mobile Home Park	DP-1698	Active	16,900
	Espanola (City of) - Wastewater Treatment Plant	DP-230	Active	160,000
	Ojo Caliente Housing Subdivision	DP-1325	Active	7,722
	Rio Arriba County Velarde Treatment Facility	DP-763	Active	7,500
	Tim's Trailer Park	DP-1815	Pending	—
Los Alamos	Los Alamos County Wastewater Treatment Facility	DP-814	Active	1,400,000
	Los Alamos County-White Rock Wastewater Treatment Facility	DP-907	Active	820,000
	Los Alamos National Laboratory	DP-857	Active	600,000
	Los Alamos National Laboratory	DP-1589	Pending	—
	Los Alamos National Laboratory	DP-1793	Active	43,200
	Los Alamos National Laboratory	DP-1835	Active	648,000
	Los Alamos National Laboratory	DP-1132	Active	41,770
Santa Fe	Agora Shopping Center	DP-1037	Active	6,000

Source: NMED, 2014b, 2016b, NMED et al., 2016

[a] Names appear as listed in the NMED database.

[b] Facilities with an NMED-designated status of active or pending are shown. Inactive facilities are not included; they can be identified on the NMED website.

gpd = Gallons per day

— = Not listed on GWQB web site

Table 5-10. Groundwater Discharge Permits in the Jemez y Sangre Water Planning Region

County	Facility Name [a]	Permit No.	Status [b]	Permitted Discharge Amount (gpd)
Santa Fe (cont.)	Bishop's Lodge	DP-75	Active	50,000
	Bishops Ridge Stoney Camp and Recreation Center	DP-1480	Active	3,800
	Buckman Road Recycling and Transfer Station	DP-1115	Active	2,500
	Caja Del Rio Landfill	DP-1120	Active	500,750
	Canyon Encantado LLC	DP-810	Active	20,000
	Cerrito Pelado Scoria Mine	DP-1576	Active	40,000
	Cielo Lindo Mobile Home Park	DP-83	Active	6,000
	Cimarron Village Wastewater Treatment Plant	DP-1838	Active	30,000
	Cottonwood RV Park	DP-1640	Active	5,000
	Cunningham Hill Mine Reclamation	DP-55	Active	35,710
	Downs at Santa Fe	DP-265	Active	418,000
	Downs Trailer Park	DP-1408	Active	4,500
	El Dorado Community School	DP-76	Active	7,950
	El Rancho Mobile Home Park	DP-871	Active	6,000
	Former Tony E Quintana Elementary School	DP-556	Active	0
	Gabriels Restaurant	DP-1493	Active	3,277
	Harrys Roadhouse	DP-1106	Active	5,500
	Juniper Hills Mobile Home Park	DP-1540	Active	12,000
	La Cienega Owners Association Condominium	DP-1108	Active	8,000

Source: NMED, 2014b, 2016b, NMED et al., 2016

[a] Names appear as listed in the NMED database.

[b] Facilities with an NMED-designated status of active or pending are shown. Inactive facilities are not included; they can be identified on the NMED website.

gpd = Gallons per day

— = Not listed on GWQB web site

Table 5-10. Groundwater Discharge Permits in the Jemez y Sangre Water Planning Region

County	Facility Name [a]	Permit No.	Status [b]	Permitted Discharge Amount (gpd)
Santa Fe (cont.)	La Pradera Water Reclamation Plant LLC	DP-1461	Active	40,000
	La Tienda at Eldorado	DP-1390	Active	6,000
	Lamy Town Center Wastewater System	DP-1078	Active	2,001
	Las Campanas Sewer Cooperative	DP-944	Active	1,500,000
	Las Lagunitas Subdivision	DP-1107	Active	207,000
	Life Healing Center	DP-1723	Active	3,600
	LifeWay Glorieta Conference Center	DP-168	Active	400,000
	Lumbre del Sol Mobile Home Park	DP-1655	Pending	—
	New Mexico (State of) Correctional Facility - State Penitentiary	DP-234	Active	280,000
	New Mexico (State of) Department of Game and Fish	DP-1254	Active	14,140
	NMDOT Bicentennial Rest Area	DP-1134	Active	5,000
	Oshara Village Water Reclamation Facility	DP-1532	Active	9,999
	Pueblo Encantado	DP-165	Active	12,000
	Rancheros de Santa Fe Campground	DP-532	Active	6,800
	Ranchland Utility - Rancho Viejo Waste Water Reclamation Plant	DP-1164	Active	400,000
	Rancho de Bosque	DP-861	Active	4,500
	Rancho de Chimayo	DP-1454	Active	8,200
	Riverside Mobile Home Park	DP-894	Active	2,750
	Sangre De Cristo Center	DP-774	Active	3,000

Source: NMED, 2014b, 2016b, NMED et al., 2016

[a] Names appear as listed in the NMED database.

[b] Facilities with an NMED-designated status of active or pending are shown. Inactive facilities are not included; they can be identified on the NMED website.

gpd = Gallons per day

— = Not listed on GWQB web site

Table 5-10. Groundwater Discharge Permits in the Jemez y Sangre Water Planning Region

County	Facility Name [a]	Permit No.	Status [b]	Permitted Discharge Amount (gpd)
Santa Fe (cont.)	Santa Fe (City of) - Sludge	DP-135	Active	28,000
	Santa Fe (City of) - Wastewater Treatment Plant	DP-289	Active	13,000,000
	Santa Fe Animal Shelter and Humane Society	DP-1644	Active	6,000
	Santa Fe Community College	DP-466	Active	30,000
	Santa Fe Country Club	DP-1407	Active	700,000
	Santa Fe County Judicial Complex Construction Site	DP-1747	Active	90,000
	Santa Fe Equestrian Center	DP-78	Active	402,335
	Santa Fe KOA	DP-1615	Active	6,100
	Santa Fe Opera	DP-974	Active	20,000
	Santa Fe Ski Basin	DP-569	Active	30,000
	Santuario de Chimayo	DP-1513	Active	2,200
	Sol Y Sombra Trailer Park	DP-704	Active	2,900
	Sunrise Springs Resort	DP-410	Active	12,000
	Tierra Contenta Subdivision-Swan Park	DP-1824	Active	210,000
	Tony E Quintana Elementary School	DP-1550	Active	9,000
	Turquoise Trail Business Park	DP-1186	Active	12,500
	Turquoise Trail Elementary School	DP-1755	Active	6,707
	Vistas de Sangre Wastewater Treatment Plant	DP-1592	Active	8,625

Source: NMED, 2014b, 2016b, NMED et al., 2016

[a] Names appear as listed in the NMED database.

[b] Facilities with an NMED-designated status of active or pending are shown. Inactive facilities are not included; they can be identified on the NMED website.

gpd = Gallons per day

— = Not listed on GWQB web site

5.4.1.2 Remediation Sites

There is currently one site in the planning region, the North Railroad Avenue plume, that is listed by the U.S. EPA (2014) as a Superfund site. Information regarding this site is provided in Table 5-11.

Table 5-11. Superfund Sites in the Jemez y Sangre Water Planning Region

Site Location	Site Name [a]	Site ID	EPA ID	Status [b]
Rio Arriba County				
Espanola, NM	North Railroad Avenue Plume	NMD986670156	604299	NPL

Sources: U.S. EPA, 2016a, 2016b

[a] Names appear as listed in the NMED database.
[b] NPL = National Priorities List

Sites undergoing investigation or cleanup pursuant to other federal authorities or state authority can be found on the EPA website (https://www.epa.gov/superfund/national-priorities-list-npl-sites-state#NM).

5.4.1.3 Leaking Underground Storage Tanks

Leaking underground storage tank (UST) sites present a potential threat to groundwater, and the NMED maintains a database of registered USTs. Many of the facilities included in the UST database are not leaking, and even leaking USTs may not necessarily have resulted in groundwater contamination or water supply well impacts. These USTs could, however, potentially impact groundwater quality in and near the population centers in the future. UST sites in the Jemez y Sangre region are identified on Figure 5-14. Many of the UST sites listed in the NMED database require no further action and are not likely to pose a water quality threat. Sites that are being investigated or cleaned up by the State or a responsible party, as identified on Table 5-12, should be monitored for their potential impact on water resources. Additional details regarding any groundwater impacts and the status of site investigation and cleanup efforts for individual sites can be obtained from the NMED database, which is accessible on the NMED website (https://www.env.nm.gov/ust/lists.html).

5.4.1.4 Landfills

Landfills used for disposal of municipal and industrial solid waste often contain a variety of potential contaminants that may impact groundwater quality. Landfills operated since 1989 are regulated under the New Mexico Solid Waste Management Regulations. Many small landfills throughout New Mexico, including landfills in the planning region, closed before the 1989 regulatory enactment to avoid more stringent final closure requirements. Other landfills have closed as new solid waste regulations became effective in 1991 and 1995. Within the planning region, there are one operating landfill and seven closed landfills (Table 5-13, Figure 5-14).

Table 5-12. Leaking Underground Storage Tank Sites in the Jemez y Sangre Water Planning Region

City [a]	Release/Facility Name [b,c]	Release ID	Facility ID	Physical Address [c]	Status [d]
Rio Arriba County					
Velarde	Michaels Mini Mart and Package Liquors	4615	29402	1410 N Taos Hwy 68	Cleanup, Responsible Party
Fairview	A S 7 To 11 Mini Mart	4043	26333	Corner El Llano Rd and Hwy 68	Cleanup, Responsible Party
Española	Big Rock	393	26929	462 Riverside Dr	Investigation, Responsible Party
	Big Rock 66	4620	26929	462 Riverside Dr	Cleanup, State Lead with CAF
	Exxon El Centro	440	27868	Hwy 84 285	Aggr Cleanup Completed, St Lead, CAF
	Fairview Station	4657	28779	1626 N Riverside Dr	Investigation, Responsible Party
	Former Circle K #716	447	28112	706 Bond Northwest	Aggr Cleanup Completed, St Lead, CAF
	Giant Stop N Go #58	2790	28328	301 Los Alamos Hwy	Aggr Cleanup Completed, Resp Party
	Giant Stop N Go 58 AST Bulk Plant	4379	28328	301 Los Alamos Hwy	Cleanup, Responsible Party
	Giant 373	4697	30103	1225 Paseo de Onate	Investigation, Responsible Party
	Hacienda de Salud	3413	6039	720 Hacienda St	Referred to Ground Water Quality Bureau
	Henry's Chevron	456	28504	Riverside Dr	Cleanup, State Lead with CAF
	RHOC Express Riverside, Thriftway 183	455	31833	902 N Riverside Dr	Aggr Cleanup Completed, Resp Party
	Roy Honstein Oil Co Bulk Plant	4666	48400	210 Los Alamos Hwy	Investigation, Responsible Party

Source: NMED, 2014b, 2016a; NMED et al., 2016

[a] Determined according to latitude/longitude information in NMED database. In some cases this information was inconsistent with the facility address, and where such an inconsistency was identified, county and city were instead determined based on the facility address.

[b] Sites with No Further Action status (release considered mitigated) are not included. Information regarding such sites can be found on the NMED website (http://www.nmenv.state.nm.us/ust/lists.html

[c] Information appears as listed in the NMED database.

[d] Pre-Investigation, Suspected Release: Release not confirmed by definition
Pre-Investigation, Confirmed Release: Confirmed release as by definition
Investigation: Ongoing assessment of environmental impact
Cleanup: Physical removal of contamination ongoing
Aggressive Cleanup Completed (Aggr Cleanup Completed): Effective removal of contamination complete
Responsible Party (Resp Party): Owner/Operator responsible for mitigation of release
State Lead: State has assumed responsibility for mitigation of release
Federal Facility: Responsibility under the Federal Govt
CAF: Corrective action fund

Table 5-12. Leaking Underground Storage Tank Sites in the Jemez y Sangre Water Planning Region

City [a]	Release/Facility Name [b,c]	Release ID	Facility ID	Physical Address [c]	Status [d]
Rio Arriba County (cont.)					
Española (cont.)	San Pedro Food Mart Shell	1301	1772	509 S Riverside Dr	Aggr Cleanup Completed, Resp Party
	San Pedro Mustang, Giant Dba Gasamat 7555	3605	31810	803 S Riverside	Investigation, Responsible Party
Santa Clara	Nmshtd/Fred's Home Center	1560	28169	NE Corner of Bayard	Aggr Cleanup Completed, Resp Party
Los Alamos County					
Los Alamos	Lanl Ta-21/2	2621	30896	Unknown	Referred to Hazardous Waste Bureau
	Los Alamos Community Center	1859	29145	15th Myrtle	Referred to Hazardous Waste Bureau
	Los Alamos National Laboratory Ta-55 Rluob Fuel Oi	4670	54763	0.06 Miles W-Northwest of Pajarito Road	Cleanup, Responsible Party
	NMDOT Los Alamos Patrol Yard Seasonal, Nmshtd Vacant	743	31431	State Rd 502	Referred to US EPA
	Ta 2-1	3517	30885	PO Box 1663	Investigation Federal Facility
Santa Fe County					
Española	Allsups - No314, Brewer Shell	2549	1219	444 N Riverside	Cleanup, Responsible Party

Source: NMED, 2014b, 2016a; NMED et al., 2016

[a] Determined according to latitude/longitude information in NMED database. In some cases this information was inconsistent with the facility address, and where such an inconsistency was identified, county and city were instead determined based on the facility address.

[b] Sites with No Further Action status (release considered mitigated) are not included. Information regarding such sites can be found on the NMED website (http://www.nmenv.state.nm.us/ust/lists.html

[c] Information appears as listed in the NMED database.

[d] Pre-Investigation, Suspected Release: Release not confirmed by definition
Pre-Investigation, Confirmed Release: Confirmed release as by definition
Investigation: Ongoing assessment of environmental impact
Cleanup: Physical removal of contamination ongoing
Aggressive Cleanup Completed (Aggr Cleanup Completed): Effective removal of contamination complete
Responsible Party (Resp Party): Owner/Operator responsible for mitigation of release
State Lead: State has assumed responsibility for mitigation of release
Federal Facility: Responsibility under the Federal Govt
CAF: Corrective action fund

Table 5-12. Leaking Underground Storage Tank Sites in the Jemez y Sangre Water Planning Region

City [a]	Release/Facility Name [b,c]	Release ID	Facility ID	Physical Address [c]	Status [d]
Santa Fe County (cont.)					
Española (cont.)	Mesa Auto Sales, Gonzales Chrysler	2489	29380	504 Riverside Dr Ne	Referred to US EPA
Pojoaque	Kokoman Discount Liquors	2329	28978	Hwy 285	Cleanup, Responsible Party
	Roadrunner Cafe	362	9030	US 285	Aggr Cleanup Completed, St Lead, CAF
	Sams Texaco	1495	30016	Route 11 Pueblo Plaza	Referred to US EPA
Santa Fe	210 And 218 Montezuma Avenue	3604	47997	210 Montezuma Ave	Cleanup, Responsible Party
	Arroyo Hondo Gulf Station	68	28598	96b Old Las Vegas Hwy	Cleanup, Responsible Party
	Capitol 66	324	27219	204 Montezuma	Aggr Cleanup Completed, Resp Party
	Chevron #75734	2448	27324	559 W Cordova Rd	Aggr Cleanup Completed, Resp Party
	Conoco Phillips- Burger King FAC. #31044, New Mexigas	1746	31044	100 N Saint Francis Dr	Aggr Cleanup Completed, Resp Party
	Former Gas Station Pojoaque	4087	53329	17809 Hwy 285	Investigation, Responsible Party
	Giant Stop N Go, Exxon W Alameda	113	28329	991 W Alameda	Aggr Cleanup Completed, Resp Party
	NM State Penitentiary	1735	1835	4311 SR 14	Pre-Investigation, Confirmed Release

Source: NMED, 2014b, 2016a; NMED et al., 2016

[a] Determined according to latitude/longitude information in NMED database. In some cases this information was inconsistent with the facility address, and where such an inconsistency was identified, county and city were instead determined based on the facility address.

[b] Sites with No Further Action status (release considered mitigated) are not included. Information regarding such sites can be found on the NMED website (http://www.nmenv.state.nm.us/ust/lists.html

[c] Information appears as listed in the NMED database.

[d] Pre-Investigation, Suspected Release: Release not confirmed by definition
Pre-Investigation, Confirmed Release: Confirmed release as by definition
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Table 5-12. Leaking Underground Storage Tank Sites in the Jemez y Sangre Water Planning Region

City [a]	Release/Facility Name [b.c]	Release ID	Facility ID	Physical Address [c]	Status [d]
Santa Fe County (cont.)					
Santa Fe (cont.)	NM State Penitentiary	4413	1835	4311 SR 14	Pre-Investigation, Confirmed Release
	Old Trail Garage	4581	29778	600 Old Santa Fe Trail	Cleanup, Responsible Party
	Peerless Tyre Co	2700	30460	3010 Cerrillos Rd	Cleanup, Responsible Party
	Peerless Tyre-SF	3047	30460	3010 Cerrillos Rd	Cleanup, Responsible Party
	Santa Fe County Judicial Co	4597	53763	Unknown	Cleanup, State Lead with CAF
	Santa Fe County Public Works, Maintenance Yard	975	30450	2600 Galisteo St	Investigation, Responsible Party
	Santa Fe Generating Station, Well-S	82	1779	Felipe St	Referred to Ground Water Quality Bureau
	Santa Fe Ski Basin	4724	30467	End of NM Hwy 475	Investigation, Responsible Party
	Shamrock-No63	4509	29206	3624 Cerrillos Rd	Cleanup, Responsible Party
	Souder Miller Emerg Resp	3671	53763	Unknown	Cleanup, State Lead with CAF
	The Bubble Machine	2361	27069	907 A Saint Francis Dr.	Aggr Cleanup Completed, Resp Party
	Wilfred Padilla Fina	4438	29836	624 Old Las Vegas Hwy	Cleanup, Responsible Party

Source: NMED, 2014b, 2016a; NMED et al., 2016

[a] Determined according to latitude/longitude information in NMED database. In some cases this information was inconsistent with the facility address, and where such an inconsistency was identified, county and city were instead determined based on the facility address.

[b] Sites with No Further Action status (release considered mitigated) are not included. Information regarding such sites can be found on the NMED website (http://www.nmenv.state.nm.us/ust/lists.html

[c] Information appears as listed in the NMED database.

[d] Pre-Investigation, Suspected Release: Release not confirmed by definition
Pre-Investigation, Confirmed Release: Confirmed release as by definition
Investigation: Ongoing assessment of environmental impact
Cleanup: Physical removal of contamination ongoing
Aggressive Cleanup Completed (Aggr Cleanup Completed): Effective removal of contamination complete
Responsible Party (Resp Party): Owner/Operator responsible for mitigation of release
State Lead: State has assumed responsibility for mitigation of release
Federal Facility: Responsibility under the Federal Govt
CAF: Corrective action fund

Table 5-13. Landfills in the Jemez y Sangre Water Planning Region

County	Landfill Name [a]	Landfill Operating Status	Landfill Closure Date
Rio Arriba	El Llano Landfill	Closed	—
	Medenales Landfill	Closed	—
Los Alamos	LANL Area [b]	Closed	—
Santa Fe	Agua Fria	Closed	—
	Caja Del Rio	Open	NA
	Plains Electric	Closed	—
	Santa Fe Downs Landfill	Closed	—
	Santa Fe Landfill	Closed	—

Sources: DBS&A, 2003; NMED, 2000, 2014b, 2015a, 2015b

[a] Names appear as listed in the NMED database.

[b] Several closed landfill sites are located at LANL

NA = Not applicable

— = Information not available

5.4.1.5 Nonpoint Sources

As noted above, a water quality concern in the planning region is groundwater contamination due to septic tanks. In areas with shallow water tables or in karst terrain, septic system discharges can percolate rapidly to the underlying aquifer and increase concentrations of (NMWQCC, 2002):

- Total dissolved solids (TDS)
- Iron, manganese, and sulfides (anoxic contamination)
- Nitrate
- Potentially toxic organic chemicals
- Bacteria, viruses, and parasites (microbiological contamination)

Because septic systems are generally spread out over rural areas, they are considered a nonpoint source. Collectively, septic tanks and other on-site domestic wastewater disposal systems constitute the single largest known source of groundwater contamination in New Mexico (NMWQCC, 2002), with many of these occurrences in the areas with shallow water tables.

Other nonpoint sources of pollutants that are a concern for water quality in the planning region include erosion and sedimentation due to stormwater runoff. This is a particular concern in areas that have been impacted by forest fire and in the canyons that drain the Pajarito Plateau, where there is potential for mobilization of waste products from former LANL activities.

One approach to addressing nonpoint source pollution is through watershed based planning or other watershed restoration initiatives that seek to restore riparian health and to address sources of contamination. In the Jemez y Sangre region, the Santa Fe Watershed Association (http://www.santafewatershed.org/) is actively involved in protection and restoration efforts for the Santa Fe River, some of which involve mitigation of nonpoint source contamination. NMED encourages cooperative planning efforts in watersheds where TMDLS are established (https://www.env.nm.gov/swqb/wps/WBP/index.html). The Galisteo Creek Watershed Restoration Action Strategy (Earth Works Institute, 2005) identified restoration projects needed to address nonpoint sources and other issues in the Galisteo Creek watershed.

The USGS New Mexico Water Science Center has developed a pre-wildfire assessment approach that can be used to decrease the hazard of post-wildfire debris flows and protect vital watersheds. An evaluation of the Sandia and Manzano mountains was published in 2014 (Tillery et al., 2014), and an evaluation of the Jemez Mountains was published in 2016 (Tillery and Haas, 2016).

5.5 Administrative Water Supply

The *Handbook* describes a common technical approach (referred to there as a *platform)* for analyzing the water supply in all 16 water planning regions in a consistent manner. As discussed in the Handbook (NMISC, 2013), many methods can be used to account for supply and demand, but some of the tools for implementing these analyses are available for only parts of New Mexico, and resources for developing them for all regions are not currently available. Therefore, the State has developed a simple method that can be used consistently across all regions to assess supply and demand for planning purposes. The use of this consistent method will facilitate efficient development of a statewide overview of the balance between supply and demand in both normal and drought conditions, so that the State can move forward with planning and funding water projects and programs that will address the regions' and State's pressing water issues.

The method to estimate the available supply, referred to as the *administrative water supply* in the Handbook, is based on withdrawals of water as reported in the *New Mexico Water Use by Categories 2010* report, which provide a measure of supply that considers both physical supply and legal restrictions (i.e., the water is physically available, and its use is in compliance with water rights policies) and thus reflects the amount of water available for use by a region. An estimate of supply during future droughts is also developed by adjusting the 2010 withdrawal data based on physical supplies available during historical droughts, as discussed in Section 5.5.2

5.5.1 2010 Administrative Water Supply

The administrative water supply (i.e., total withdrawals) in 2010 for the Jemez y Sangre region, as reported in the *New Mexico Water Use by Categories 2010* report (Longworth et al., 2013),

was 90,477 acre-feet. Of this total, 70,143 acre-feet were surface water withdrawals and 20,334 acre-feet were groundwater. The breakdown of these withdrawals among the various categories of use detailed in the *New Mexico Water Use by Categories 2010 report* is discussed in Section 6.1.

5.5.2 Drought Supply

The variability in surface water supply from year to year is a better indicator of how vulnerable a planning region is to drought in any given year or multi-year period than is the use of long-term averages. As discussed in Section 5.1.1, the PDSI is an indicator of whether drought conditions exist and if so, what the relative severity of those conditions is. For the two climate divisions present in the Jemez y Sangre region (Divisions 2 and 6), the PDSI classifications for 2010 were near normal. Given that the water use data for 2010 represent a normal year, it cannot be assumed that this supply will be available in all years; it is important that the region also consider potential water supplies during drought periods.

There is no established method or single correct way of quantifying a drought supply given the complexity associated with varying levels of drought and constantly fluctuating water supplies. For purposes of having an estimate of drought supplies for regional and statewide water planning, the State has developed and applied a method for regions with both stream-connected and non-stream-connected aquifers. The method adopted for stream-connected aquifers is described below:

- The drought adjustment is applied only to the portion of the administrative water supply that derives from surface water, as it is assumed that groundwater supplies will be available during drought due to the relatively stable thicknesses of groundwater aquifers that are continuously recharged through their connection to streams. While individual wells may be depleted due to long-term drought, this drought adjustment does not include an evaluation of diminished groundwater supplies.

- The minimum annual yield for key stream gages on mainstem drainages (Table 5-4b) was compared to the 2010 yield, and the gage with the lowest ratio of minimum annual yield to 2010 yield was selected.

- The 2010 administrative surface water supply for the region was then multiplied by that lowest ratio to provide an estimate of the surface water supply adjusted for the maximum drought year of record.

For the Jemez y Sangre region, the gage with the minimum ratio of annual yield to 2010 yield is the Rio Grande at Embudo (on a main stem stream with most of the surface water use), with a ratio of 0.40 for minimum annual yield (201,118 acre-feet in 2002) to 2010 yield (500,623 acre-feet) (USGS, 2014c). Based on the region's total administrative surface water supply of

70,143 acre-feet (Section 5.5.1), the drought-adjusted surface water supply is 28,060 acre-feet. With the 20,330 acre-feet of groundwater supply, the total drought supply is 48,390 acre-feet, or about 53 percent of a normal year administrative water supply of 90,477 acre-feet.

Though the adjustment is based on the minimum year of streamflow recorded to date, it is possible that drought supplies could be even lower in the future. Additionally, water supplies downstream of reservoirs may be mitigated by reservoir releases in early drought phases, while longer-term droughts can potentially have greater consequences. The statewide drought adjustment does not evaluate mitigating influences of reservoir storage in early phases of a drought when storage is available or potential development of new groundwater supplies or conjunctive use plans, and given that the City and County of Santa Fe have both developed conjunctive use management plans that allow for use of groundwater when surface water is not available due to drought, thus lessening drought impacts, this drought adjustment is a conservative estimate for the Jemez y Sangre region. Nonetheless, the adjustment drought supply provides a rough estimate of what may be available during a severe to extreme drought year.

The drought adjustment does not consider the priority date or source of supply for a particular water user. For instance, the irrigation demands from the Rio Grande (which provides the most surface water in the region) are less than the minimum supply recorded at Embudo and thus may not be impacted by a drought. On the other hand, irrigation from Tesuque Creek may be impacted much more during a drought.

6. Water Demand

To effectively plan for meeting future water resource needs, it is important to understand current use trends as well as future changes that may be anticipated. This section includes a summary of current water use by category (Section 6.1), an evaluation of population and economic trends and projections of future population (Sections 6.2 and 6.3), a discussion of the approach used to incorporate water conservation in projecting future demand (Section 6.4), and projections of future water demand (Section 6.5).

Four terms frequently used when discussing water throughout this plan have specific definitions related to this RWP:

- *Water use* is water withdrawn from a surface or groundwater source for a specific use. In New Mexico water is accounted for as one of the nine categories of use in the *New Mexico Water Use by Categories 2010* report prepared by the NMOSE.
- *Water withdrawal* is water diverted or removed from a surface or groundwater source for use.

- *Administrative water supply* is based on the amount of water withdrawals in 2010 as outlined in the *New Mexico Water Use by Categories 2010* report.
- *Water demand* is the amount of water needed at a specified time.

6.1 Present Uses

The most recent assessment of water use in the region was compiled by NMOSE for 2010, as discussed in Section 5.5. The *New Mexico Water Use by Categories 2010* report (Longworth et al., 2013) provides information on total withdrawals for nine categories of water use:

- Public water supply
- Domestic (self-supplied)
- Irrigated agriculture
- Livestock (self-supplied)
- Commercial (self-supplied)
- Industrial (self-supplied)
- Mining (self-supplied)
- Power (self-supplied)
- Reservoir evaporation

The total surface water and groundwater withdrawals for each category of use, for each county, and for the entire region, are shown on Table 6-1 and Figure 6-1.

The predominant water use in 2010 in the Jemez y Sangre region was for irrigated agriculture, which is supplied almost entirely by surface water, followed by public water supply. No reservoir evaporation use is listed in Table 6-1, because the NMOSE only tracks reservoirs above 5,000 acre-feet in size. Estimates of evaporation from the smaller reservoirs in the region were included in the accepted water plan (DBS&A and Lewis, 2003).

Most of the groundwater use in the Jemez y Sangre region is for public water supply, followed by domestic and commercial self-supplied uses. Groundwater points of diversion are shown in Figure 6-2.

The categories included in the *New Mexico Water Use by Categories 2010* report and shown on Figure 6-1 and Table 6-1 represent the total withdrawals in the planning region. Tribes and Pueblos in New Mexico are not required to provide water use data to the State; therefore, tribal water use data are not necessarily reflected in this plan. There are also some unquantified additional categories of water use, including riparian evapotranspiration and instream flow.

Table 6-1. Total Withdrawals in the Jemez y Sangre Water Planning Region in 2010

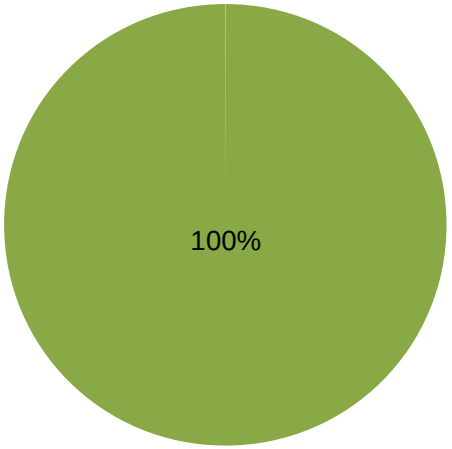
Water Use Category	Withdrawals (acre-feet) [a]														
	Rio Arriba County [b]			Los Alamos County			Santa Fe County [b]			Sandoval County			Planning Region		
	Surface Water	Ground-water	Total	Surface Water	Ground-water	Total	Surface Water	Ground-water	Total	Surface Water	Ground-water	Total	Surface Water	Ground-water	Total
Commercial (self-supplied)	0	434	434	0	0	0	0	1,689	1,689	0	0	0	0	2,122	2,122
Domestic (self-supplied)	0	1,364	1,364	0	0	0	0	2,297	2,297	0	0	0	0	3,660	3,660
Industrial (self-supplied)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Irrigated agriculture	47,081	235	47,316	0	0	0	18,390	428	18,818	0	0	0	65,471	663	66,134
Livestock (self-supplied)	11	12	23	0	0	0	38	50	88	0	0	0	49	62	111
Mining (self-supplied)	0	546	546	0	0	0	0	45	45	0	0	0	0	592	592
Power (self-supplied)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Public water supply	0	1,395	1,395	21	4,044	4,065	4,602	7,795	12,397	0	0	0	4,623	13,234	17,857
Reservoir evaporation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	47,091	3,986	51,078	21	4,044	4,065	23,030	12,304	35,334	0	0	0	70,143	20,334	90,477

Source: Longworth et al., 2013

[a] Tribes and pueblos in New Mexico are not required to provide water use data to the State. Therefore, tribal water use data are not necessarily reflected in this table.

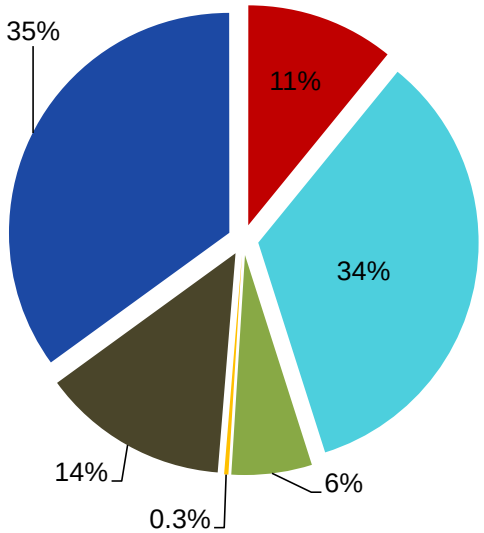
[b] Portion of the county within the planning region.

Surface Water



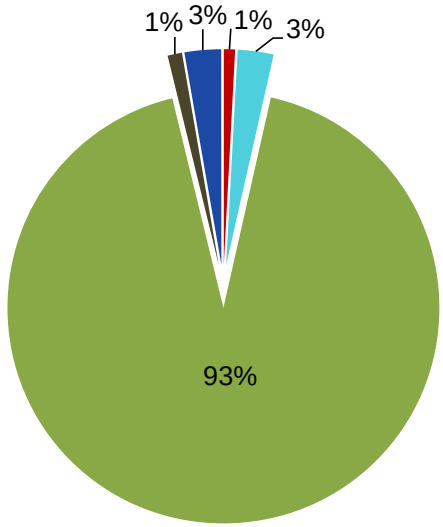
Total usage: 47,091 acre-feet

Groundwater



Total usage: 3,986 acre-feet

Total



Total usage: 51,078 acre-feet

Explanation

- Commercial (self-supplied)
- Domestic (self-supplied)
- Industrial (self-supplied)
- Irrigated agriculture
- Livestock (self-supplied)
- Mining (self-supplied)
- Power (self-supplied)
- Public water supply
- Reservoir evaporation

Source: Longworth et al., 2013

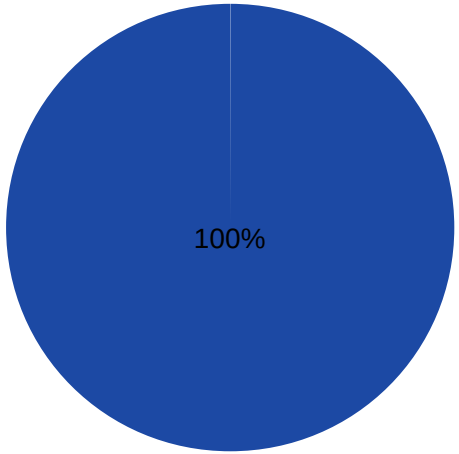
Notes:
1. Only categories with usage above 0.1% are shown.
2. Tribes and pueblos in New Mexico are not required to provide water use data to the State. Therefore, tribal water use data are not necessarily reflected in this figure.

JEMEZ Y SANGRE
REGIONAL WATER PLAN 2016

Rio Arriba County Water Demand, 2010

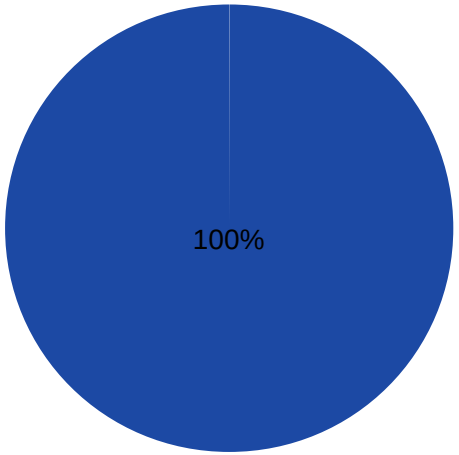
Figure 6-1a

Surface Water



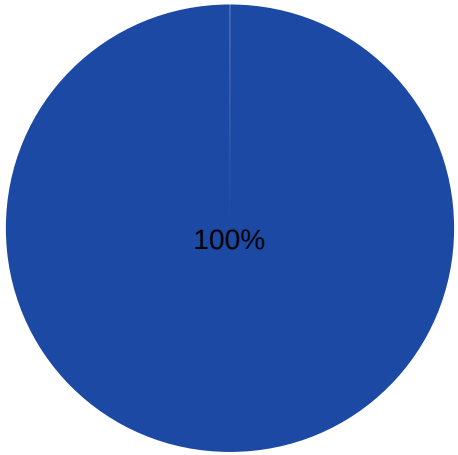
Total usage: 21 acre-feet

Groundwater



Total usage: 4,044 acre-feet

Total



Total usage: 4,065 acre-feet

Explanation

- Commercial (self-supplied)
- Domestic (self-supplied)
- Industrial (self-supplied)
- Irrigated agriculture
- Livestock (self-supplied)
- Mining (self-supplied)
- Power (self-supplied)
- Public water supply
- Reservoir evaporation

Source: Longworth et al., 2013

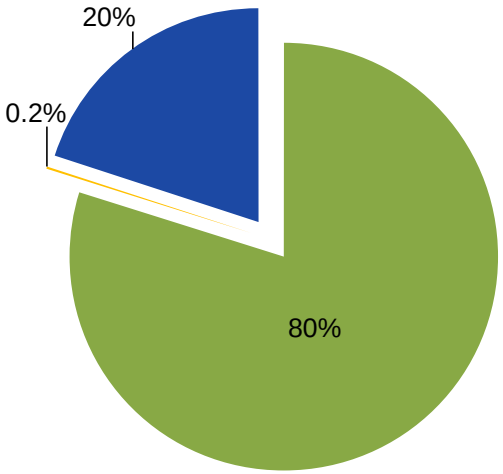
Notes:
1. Only categories with usage above 0.1% are shown.
2. Tribes and pueblos in New Mexico are not required to provide water use data to the State. Therefore, tribal water use data are not necessarily reflected in this figure.

JEMEZ Y SANGRE
REGIONAL WATER PLAN 2016

Los Alamos County Water Demand, 2010

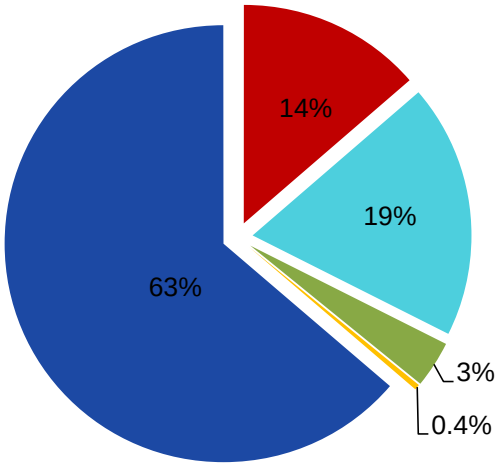
Figure 6-1b

Surface Water



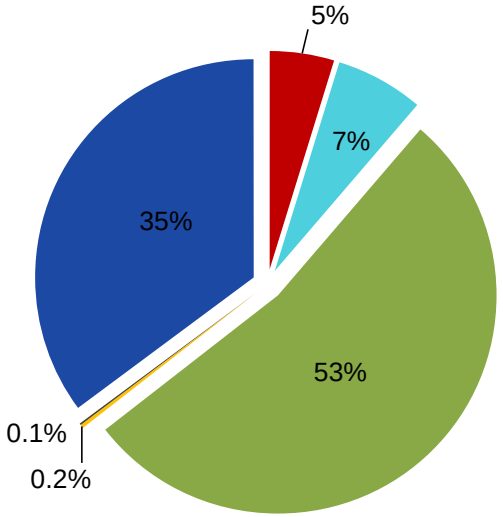
Total usage: 23,030 acre-feet

Groundwater



Total usage: 12,304 acre-feet

Total



Total usage: 35,334 acre-feet

Explanation

- Commercial (self-supplied)
- Domestic (self-supplied)
- Industrial (self-supplied)
- Irrigated agriculture
- Livestock (self-supplied)
- Mining (self-supplied)
- Power (self-supplied)
- Public water supply
- Reservoir evaporation

Source: Longworth et al., 2013

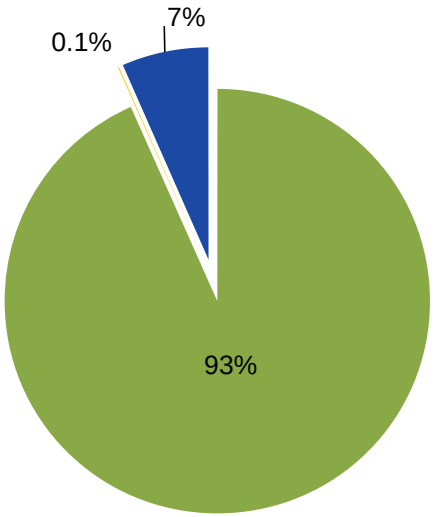
Notes:
1. Only categories with usage above 0.1% are shown.
2. Tribes and pueblos in New Mexico are not required to provide water use data to the State. Therefore, tribal water use data are not necessarily reflected in this figure.

JEMEZ Y SANGRE
REGIONAL WATER PLAN 2016

Santa Fe County Water Demand, 2010

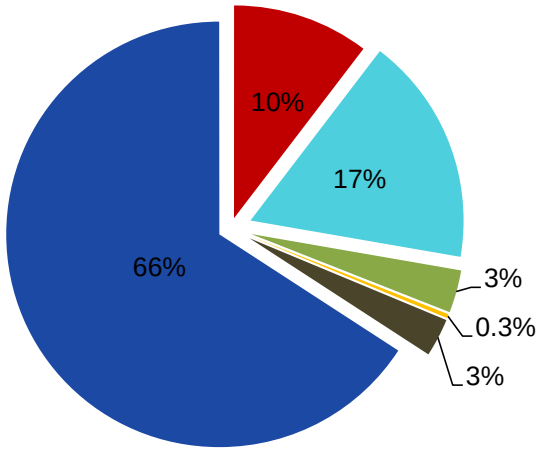
Figure 6-1c

Surface Water



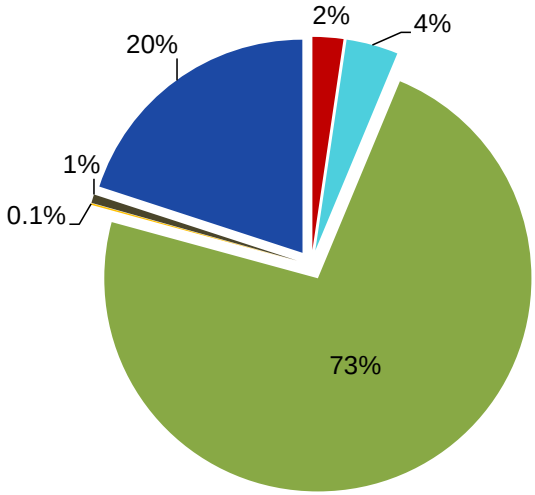
Total usage: 70,143 acre-feet

Groundwater



Total usage: 20,334 acre-feet

Total



Total usage: 90,477 acre-feet

Explanation

- Commercial (self-supplied)
- Domestic (self-supplied)
- Industrial (self-supplied)
- Irrigated agriculture
- Livestock (self-supplied)
- Mining (self-supplied)
- Power (self-supplied)
- Public water supply
- Reservoir evaporation

Source: Longworth et al., 2013

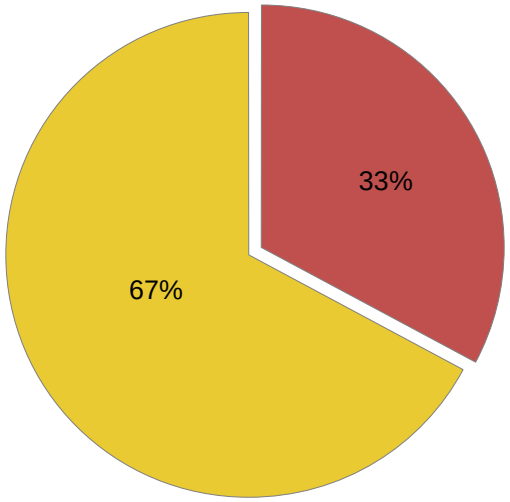
Notes:
1. Only categories with usage above 0.1% are shown.
2. Tribes and pueblos in New Mexico are not required to provide water use data to the State. Therefore, tribal water use data are not necessarily reflected in this figure.

JEMEZ Y SANGRE
REGIONAL WATER PLAN 2016

Total Regional Water Demand by Sector, 2010

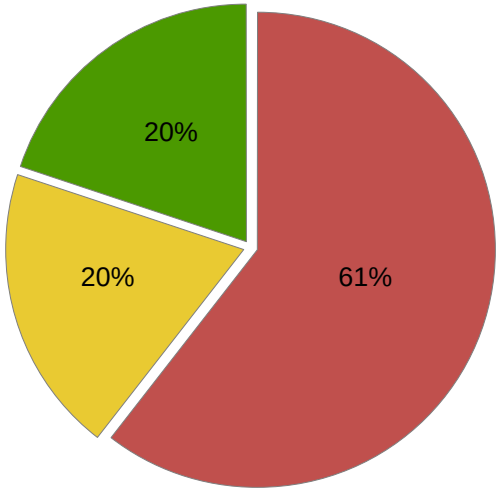
Figure 6-1d

Surface Water



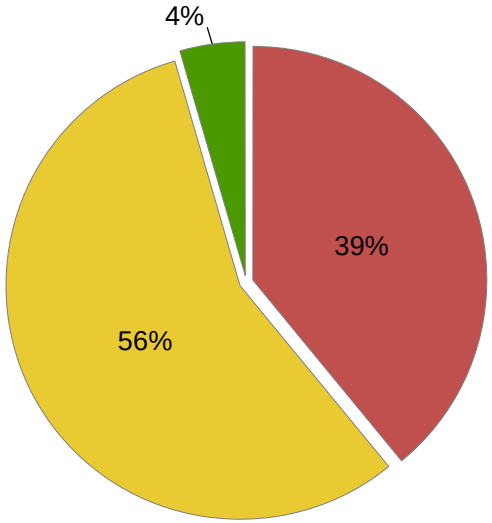
Total usage: 70,143 acre-feet

Groundwater



Total usage: 20,334 acre-feet

Total



Total usage: 90,477 acre-feet

Explanation

- Santa Fe
- Rio Arriba
- Los Alamos

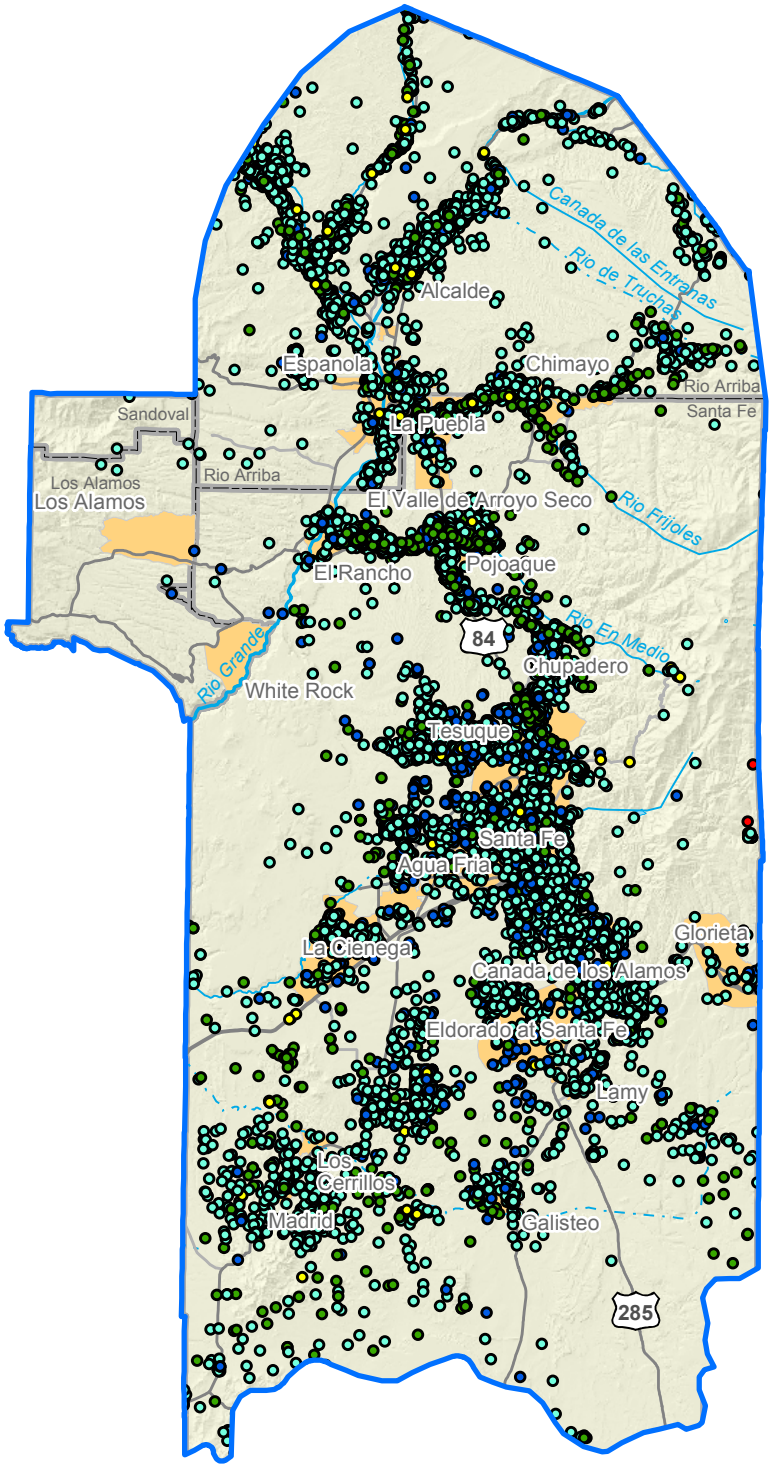
Source: Longworth et al., 2013

Notes:
1. Due to rounding, the percentages may not add to 100%.
2. Tribes and pueblos in New Mexico are not required to provide water use data to the State. Therefore, tribal water use data are not necessarily reflected in this figure.

Figure 6-1e

JEMEZ Y SANGRE
REGIONAL WATER PLAN 2016

Total Regional Water Demand by County, 2010



N

0 5 10 Miles

Explanation

- Stream (dashed where intermittent)
- Lake
- City
- County
- Water planning region

Well (use)

- Agriculture/irrigation
- Commercial/industrial/recreation
- Domestic
- Mining/oil/gas
- Public water supply

Source: NMOSE, 2014d

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Groundwater Points of Diversion

Figure 6-2

S:\PROJECTS\WR12.0165_STATE_WATER_PLAN_2012\GIS\MXDS\FIGURES_2016\JEMEZ_Y_SANGRE\FIG6-2_POINTS_OF_DIVERSION.MXD 6/15/2016

- *Riparian evapotranspiration:* Some research and estimates have been made for riparian evapotranspiration in selected areas, such as along the middle and lower Rio Grande (Thibault and Dahm, 2011; Coonrod and McDonnell, Undated; Bawazir et al., 2009), but riparian evapotranspiration has not been quantified statewide. The New Mexico Water Resources Research Institute is currently developing those estimates, but the results are not yet available. Though riparian evapotranspiration is anticipated to consume a relatively large quantity of water statewide, it will not affect the calculation of the gap between supply and demand using the method in this report, because the gap reflects the difference between future anticipated demands and present demands, and if both present and future uses do not include the riparian evapotranspiration category, then the difference will not be affected. The only impact to the gap calculation would be if evapotranspiration significantly changes in the future. There is potential for such a change due to warming temperatures, but anticipated changes have not been quantified and would be subject to considerable uncertainty. Anticipated changes in riparian and stream evapotranspiration are areas that should be considered in future regional and state water plan updates.

- *Instream flow:* The analysis of the gap between supply and demand relies on the largest use categories that reflect withdrawals for human use or reservoir storage that allows for withdrawals downstream upon release of the stored water. It is recognized that there is also value in preserving instream water for ecosystem and habitat and tourism purposes. Though this value has not been quantified in the supply/demand gap calculation, it may still be an important use in the region, and if the region chooses, it may recommend instream flow protections in its policy, program, and project recommendations.

In addition to the special conditions listed above, the data provided in the *New Mexico Water Use by Categories 2010* report are available for withdrawals only; depletions have not been quantified. In many cases, some portion of diverted water returns to surface or groundwater, for example from agricultural runoff or seepage or discharge from a wastewater treatment plant. In those locations where there is such return flow, the use of withdrawals data for planning purposes will add a margin of safety; thus the use of withdrawals data is a conservative approach for planning purposes.

6.2 Demographic and Economic Trends

To project future water demands in the region, it is important to first understand demographics, including population growth and economic and land use trends as detailed below. This information was used to project population, economic growth, and future water demand, as presented in Sections 6.3 and 6.5. The 2013 populations of Rio Arriba, Los Alamos, and Santa Fe counties were 40,072, 17,798, and 147,423, respectively (U.S. Census Bureau, 2014a). As shown in Table 3-1a, Santa Fe County grew from 129,292 persons in 2000 to 144,170 in 2010,

while Rio Arriba and Los Alamos each experienced declines in population. This trend has continued through 2013, with the population of Santa Fe County increasing to 147,423 and Rio Arriba and Los Alamos experiencing small declines.

The economy of the region has traditionally been driven by tourism and government employment, including LANL. The largest employment categories in the region are education/healthcare, professional and scientific services, retail trade, tourism-related services (arts, entertainment, recreation, hospitality, and food services), and public administration. Agriculture is the largest water user, followed by reservoir evaporation and public water supply.

Santa Fe is the state's second largest tourism destination (Tourism Economics, 2011), and the economies of Los Alamos and Rio Arriba counties are also somewhat dependent upon tourism. The region is home to Santa Fe Community College (with an enrollment of 8,000), Northern New Mexico Community College, branches of the University of New Mexico, Santa Fe University of Art and Design, and St. Johns College.

As noted in Table 3-1d, cattle and calves are the most important agricultural commodities, followed by other crops and hay. A land use map was included in the accepted water plan and there have not been substantial changes.

Specific information regarding the population and economic trends in each county is provided in Sections 6.2.1 through 6.2.3. The information provided in these sections was obtained primarily from telephone interviews with government officials and other parties with knowledge of demographic and economic trends in the three counties; the list of interviewees is provided in Appendix 6-A. The information in these following subsections was used to project population, economic growth, and future water demand, as presented in Sections 6.3 and 6.5.

6.2.1 Rio Arriba County

The City of Española, which is partially in Santa Fe and partially in Rio Arriba County, is the largest community within Rio Arriba County. The population of Rio Arriba County has generally increased over time. Population increased from 13,777 in 1900 to 25,352 in 1940. The population held steady between 1940 and 1970, before showing steady growth from 1970 to 2000, during which time it increased by 63.7 percent. Since 2000, the population has declined slightly, to 40,072 in 2013 (U.S. Census Bureau, 2014). Some officials in Rio Arriba County believe that there was an undercount of persons living on reservations and in rural areas in 2010 and that the population actually grew between 2000 and 2010. If there was an undercount in 2010, however, it is quite possible that there was also an undercount in 2000, with no growth occurring during that decade.

The economy of Rio Arriba County has traditionally been driven by agriculture, tourism, and government employment, including LANL. The largest employment categories are

education/healthcare, professional, scientific, and management, tourism-related services (arts, entertainment, recreation, hospitality, food services), and public administration.

Wage and salary employment has generally decreased since 2006 and stood at 16,979 jobs in 2013. Those persons interviewed concur that recovery from the recession has been slow and that no major increases in economic activity are anticipated in the foreseeable future. One of the major drivers of the economy in the county, LANL, has experienced reductions in staff in recent years and is not expected to add any new staff over the foreseeable future. In Española, little growth is expected in the near term, although some growth in the Española downtown area could be supported by activity at Northern New Mexico College. There is also likely to be annexation of existing development areas into Española.

The Arrowhead Center at NMSU analyzed the economy of Rio Arriba County and identified the basic industries that support the economy (Arrowhead Center, 2013). Basic industries bring outside dollars into the economy. A basic industry frequently has a location quotient (LQ) greater than 1.0, which means that its relative share of the local economy is greater than that industry's relative share of the state economy. In Rio Arriba County, the primary basic industries in 2011 were agriculture (LQ of 3.57), government (LQ of 1.60), and arts, entertainment, and recreation (LQ of 1.19). Agriculture now accounts for less than 9 percent of all employment within the county.

According to the Census of Agriculture, the most valuable agricultural commodities in Rio Arriba County are cattle and calves, other crops and hay, fruit, tree nuts, and berries, and vegetables and melons (USDA NASS, 2014). From 2007 to 2012, the number of farms and ranches increased by 44.2 percent, from 1,312 to 1,892, while the amount of land in farms and ranches declined by 1.9 percent. There is some speculation that some of this decrease is due to farms and ranches being considered as tribal land and not being counted in the agricultural census. Between 2007 and 2012, the amount of irrigated acreage declined by 5.1 percent from 30,752 acres to 29,199 acres. In 2012, the average payment to a farmer participating in agricultural support programs was $4,643, up from $3,675 in 2007, an increase of 26 percent, with a total of $1,277,000 in government payments going to farmers in Rio Arriba County. The average farm had a net cash operating loss of $1,791. The average age of a farmer in 2012 was 61.2.

The drought has also had a significant impact on cattle herds in Rio Arriba County. Because so little hay is available, the supply is limited and very expensive, and the rangeland is not producing much grass. Due to the drought, it is more difficult to lease ranchland, with many leases being canceled. Therefore ranchers have sold off a large portion of their herds (NRCS, 2014).

6.2.2 Los Alamos County

Los Alamos is an urban county, with no unincorporated communities. From 1950 to 1980, the population grew fairly steadily (10,476 to 17,599), but since 1980 there has been almost no net growth. Since 2010, the population has declined, with the population in 2013 estimated at 17,798 (U.S. Census Bureau, 2014a). Wage and salary employment has also decreased by 800 persons since 2010, due to reductions in force at LANL.

According to the Arrowhead Center at NMSU (2013), the only basic industry in 2011 in Los Alamos County was professional scientific and technical services with an LQ of 8.10; this industry provided 11,888 jobs in 2011. The County has been adversely affected by the reduction in force at LANL (which pumped more than $1. 6 billion into the regional economy in fiscal year 2009 [Bhandari, 2011]), as well as by the lack of a diversified economy and a lack of sites for new housing development. The County is making efforts to provide sites for housing and commercial development, which would in turn increase the local tax base.

According to the Census of Agriculture, agricultural activity in Los Alamos County is very limited (USDA NASS, 2014). Because of the limited activity, there are no data on the crops that are sold. The number of farms and ranches increased from seven in 2007 to nine in 2012, and the amount of land in farms and ranches increased from 9 acres to 17 acres. The average farm had a net cash operating loss of $6,202. The average age of a farmer in 2012 was 50.5, considerably below the state average.

6.2.3 Santa Fe County

The City of Santa Fe comprises over half of the population of the portion of Santa Fe County within the region. Santa Fe County experienced relatively steady growth over the past three-quarters of a century, with the population increasing from 30,826 in 1940 to 53,756 in 1970, 98,928 in 1990, and 144,170 in 2010. Since 2010, growth has been somewhat slower, with the population in 2013 estimated to be 147,423 (U.S. Census Bureau, 2014a).

Wage and salary employment has been flat since 2010, with a figure of 70,472 in 2013. The civilian labor force has declined slightly since 2010. The Arrowhead Center's analysis of the economy of Santa Fe County identified the primary basic industries in 2011 in Santa Fe County as state government (LQ of 1.96), accommodations and food services (LQ of 1.28), arts, entertainment, and recreation (LQ of 2.04), professional, scientific, and technical services (LQ of 1.07), and real estate rental and leasing (LQ of 1.29). Since 2009, the cutback in state government employment has lowered its LQ from 2.08 to the current 1.96.

Santa Fe, like the other counties in the region, has been adversely impacted by the recession and cutbacks in employment at LANL and in state and local government. The tourism industry has made a recovery, with hotel occupancy exceeding 80 percent during July 2014, the first time that figure has been exceeded in seven years. Hotel revenues for the summer of 2014 (July through

September) exceeded $57 million, up 8 percent over the summer of 2013 (Randall, 2014). New home construction remains quite slow, with housing prices still well below the peak prices of 2008.

According to the Census of Agriculture, the most valuable agricultural commodities in Santa Fe County are cattle and calves, nursery and greenhouse, and hay and other related crops (USDA NASS, 2014). From 2007 to 2012, the number of farms and ranches increased by 46 percent, from 489 to 715, and the amount of land in farms and ranches grew by 26 percent, from 569,404 acres to 717,704 acres. This led to a small decrease in average farm size, from 1,164 acres in 2007 to 1,004 acres in 2012. The Census reported 8,864 irrigated acres in 2012.

In 2012, the average payment to a farmer participating in agricultural support programs was $9,621, up 332 percent from 2007, with a total of $394,000 in government payments going to farmers in Santa Fe County. The average farm had a net cash operating loss of $9,769. The average age of a farmer in 2012 was 58.5.

The majority of farms and ranches in the county are family-owned and under 10 acres in size, with larger farms mostly for grazing and alfalfa. Most farmers are in their 50s and 60s or older, but there is a resurgence of farming among younger people, who are primarily hobbyists with other sources of income. Due to the drought, it is more difficult to lease ranchland, and ranchers have been culling their herds substantially.

6.3 Projected Population Growth

The population projections for the 2003 Regional Water Plan consisted of a "Most Likely" projection, covering the period from 2000 through 2060. A population study completed for the plan (DBS&A and Lewis, 2003, Appendix E) projected population for the entirety of the three counties within the region. As shown in Table 6-2, the Most Likely forecast, developed in November 2000 (prior to the release of the 2000 Census data) using 1999 data from BBER, projected a 2010 population of 221,250 for the entirety of the three counties. The actual population from the 2010 Census for the entirety of the counties was lower, at 202,366 (Table 6-2). The 2003 plan also projected population to 2060 for the portions of the three counties that lie within the Jemez y Sangre region. The BBER projection predicted a total regional population of 190,926 in 2010, which was more than the 2010 Census figure of 181,664 for the portions of the counties within the region (Table 6-2).

New Mexico has been one of the slowest states to recover from the 2008-2009 recession, with much of the impact of the recession still being felt within the Jemez y Sangre region. Thus the population projected in 1999 by BBER and used in the 2003 plan over-estimated the population growth predicted to occur by 2010. While Santa Fe County has had stable employment since 2010, Rio Arriba and Los Alamos counties have experienced significant declines, with a loss of 1,200 jobs in Rio Arriba County and 800 jobs in Los Alamos County (New Mexico Department of Workforce Solutions, 2014).

Table 6-2. Comparison of Projected and Actual 2010 Population

County	2003 Regional Water Plan Projected Population [a]		Actual Population 2010 U.S. Census	
	Entire County	County Portion Within Planning Region	Entire County [b]	County Portion Within Planning Region [c]
Rio Arriba	45,058	NA	40,246	29,558
Los Alamos	19,913	NA	17,950	17,950
Santa Fe	156,279	NA	144,170	134,156
Total Region	221,250	190,926	202,366	181,664

[a] DBS&A and Lewis, 2003

NA = Information not available

[b] U.S. Census Bureau, 2014a

[c] U.S. Census Bureau, 2010

The Department of Workforce Solutions projected in 2013 that Santa Fe County would gain 9,640 jobs between 2010 and 2020, an increase of 14.5 percent or about 1.4 percent per year. The industries with the greatest growth are expected to be health care and social assistance (an industry that is growing nationally because of the Affordable Care Act), tourism, retail, and educational services.

For the entire Northern Workforce Region (which includes the Jemez y Sangre region and several other northern counties), the Department of Workforce Solutions projected in 2013 that there would be an addition of 32,000 jobs by 2020, led by growth in educational services, food services, and health care.

LANL projects their workforce to remain flat or decline slightly over the next three to five years. More LANL activities (e.g., medical isotope creation) may be privatized to generate economic activity. According to a *Santa Fe New Mexican* article, Mark Muro, a senior fellow with the Metropolitan Policy Program at the Brookings Institution is more pessimistic about jobs being generated by LANL, stating that their ". . . deep heritage of defense activity has created a culture within the labs that is occasionally still resistant to collaboration . . . " and " . . . the legacy of military history ensures that the basic science and defense labs often still operate as if commercial applications and private-sector partnerships were inconsistent with their scientific mission" (Malone, 2014).

City of Santa Fe officials project that the Santa Fe urban area could see an increase from 84,877 residents in 2010 to 87,000 to 90,000 by 2020 and between 93,000 and 95,000 by 2030. This is equivalent to an average annual growth rate of about 0.5 percent. In 2013, 175 new housing units were built in the City and another 101 in the County within the urban area. Santa Fe County commissioned a new population forecast by BBER, which was released in September 2014.

This forecast predicted the County population to increase from 144,170 in 2010 to 151,910 in 2020 and 165,290 in 2030 (Baker, 2014).

The 2010 Rio Arriba County Comprehensive Plan projected an annual population growth rate of 0.87 percent through 2030.

A 2006 long-range water supply plan for Los Alamos County projected a potential maximum ("build out") population of 25,086 in 2020 (DBS&A, 2006). The County currently has a goal of 20,000 residents in 2020; the increase would depend on providing housing for workers who now commute to Los Alamos.

For the population projections through 2060 (Table 6-3) for this RWP update, two population forecasts were developed: one based on a moderately optimistic view of the economy for this region over the long term and one that portrays a more pessimistic picture. The current (2012) BBER statewide population projections through 2040 (Appendix 6-B) were used as a starting point for the low projections, extrapolated through 2060, in Rio Arriba and Los Alamos counties. The high forecast for Los Alamos assumes that the goal of a population of 20,000 is achieved in 2020, with a very low rate of growth thereafter. For the Rio Arriba County high projection, it was assumed that the rate of growth for the county would be equivalent to BBER's 2014 projection for the portion of Española that is within Santa Fe County. For Santa Fe County, the low forecast is based on BBER's 2014 projection for Santa Fe County, excluding the City of Edgewood and the adjacent Estancia water planning region. The high forecast assumes an annual growth rate that is double that of the low.

Based on these assumptions, a 2060 population of between 15,863 and 22,092 is projected in Los Alamos County, 28,068 to 55,773 in Rio Arriba County, and 184,807 to 253,828 in Santa Fe County. The population for the entire region is projected to range between 228,738 and 331,693 in 2060. The population projections are detailed in Table 6-3.

6.4 Water Conservation

Water conservation is often a cost-effective and easily implementable measure that a region may use to help balance supplies with demands. The State of New Mexico is committed to water conservation programs that encourage wise use of limited water resources. The Water Use and Conservation Bureau of the NMOSE developed the *New Mexico Water Conservation Planning Guide for Public Water Suppliers*. When evaluating water rights transfers or 40-year water development plans that hold water rights for future use, the NMOSE considers whether adequate conservation measures are in place. However, the 40 year water development plans are not incorporated into the RWP updates, as the resources needed to complete this work are not currently available. It is therefore important when planning for meeting future water demand to consider the potential for conservation.

Table 6–3. Jemez y Sangre Population Projections July 1, 2010 to July 1, 2060

a. Annual Growth Rate

County	Projection	Growth Rate (%)				
		2010-2020	2020-2030	2030-2040	2040-2050	2050-2060
Rio Arriba	High	1.15	1.46	1.36	1.26	1.16
	Low	0.16	–0.04	–0.21	–0.21	–0.21
Los Alamos	High	1.09	0.40	0.30	0.20	0.10
	Low	0.02	–0.10	–0.38	–0.38	–0.38
Santa Fe	High	0.82	1.70	1.50	1.30	1.10
	Low	0.41	0.85	0.75	0.65	0.55

b. Projected Population

County	Projection	Population					
		2010	2020	2030	2040	2050	2060
Rio Arriba	High	29,558	33,132	38,297	43,850	49,699	55,773
	Low	29,558	30,037	29,923	29,291	28,673	28,068
Los Alamos	High	17,950	20,000	20,812	21,447	21,874	22,092
	Low	17,950	17,988	17,789	17,123	16,480	15,863
Santa Fe	High	134,156	145,573	172,314	199,988	227,546	253,828
	Low	134,156	139,804	152,163	163,970	174,940	184,807

Source: Poster Enterprises, 2014

To develop demand projections for the region, some simplifying assumptions regarding conservation have been made. These assumptions were made only for the purpose of developing an overview of the future supply-demand balance in the region and are not intended to guide policy regarding conservation for individual water users. The approach to considering conservation in each category of water use for developing water demand projections is discussed below. Specific recommendations for conservation programs and policies for the Jemez y Sangre region, as identified by the regional steering committee, are provided in Section 8. A detailed assessment of the conservation potential for the region, including an examination of the per capita use of single family residents so that comparisons can be made between actual use and potential use if conservation measures are applied, is provided in a study of water resources in the Española Basin prepared for Santa Fe County (Lewis et al., 2013).

Public water supply. Public water suppliers that have large per capita usage have a greater potential for conservation than those that are already using water more efficiently. Through a cooperative effort with seven public water suppliers, the NMOSE developed a GPCD (gallons per capita per day) calculation to be used statewide, thereby standardizing the methods for calculating populations, defining categories of use, and analyzing use within these categories. The GPCD calculator was used to arrive at the per capita uses for public water systems in the region, shown in Table 6-4. These rates are provided to assist the regional steering committee in considering specific conservation measures.

The system-wide per capita usage for each water supplier includes uses such as golf courses, parks, and commercial enterprises that are supplied by the system. Hence there can be large variability among the systems. For purposes of developing projections, a county-wide per capita rate was calculated as the total public supply use in the county divided by the total county population (or portion of the county within the region), excluding those served by domestic wells. For future projections (Section 6.5), a consistent method is being used statewide that assumes that conservation would reduce future per capita use in each county by the following amounts:

- For current average per capita use greater than 300 gpcd, assume a reduction in future per capita use to 180 gpcd.
- For current average per capita use between 200 and 300 gpcd, assume a reduction in future per capita use to 150 gpcd.
- For current average per capita use between 130 and 200 gpcd, assume a reduction in future per capita use to 130 gpcd.
- For current average per capita use less than 130 gpcd, no reduction in future per capita use is assumed.

Table 6-4. 2010 Water Withdrawals for Drinking Water Supply Systems and Rural Self-Supplied Homes

OSE Declared Groundwater Basin(s) [a]	Water Supplier [b]	Population	Per Capita Use (gpcd)	Withdrawals (acre-feet)	
				Surface Water	Groundwater
Santa Fe County					
Estancia	Entranosa Water and Wastewater Coop [c] - part	4,224	76	0	359
	EPCOR/New Mexico American Water Co. - part	4,320	114	0	551
	Santa Fe County public water supply totals	8,544		0	911
	County-wide public water supply per capita use [d]		95		
Estancia Upper Pecos	Rural self-supplied homes (Rio Grande and Pecos)	1,470	80	0	132
	Santa Fe County domestic self-supplied totals	1,470		0	132
	County-wide domestic self-supplied per capita use [d]		80		
Bernalillo County					
Estancia	Bearcat Homeowners Assn	100	59	0	7
	Chilili WUA	90	70	0	7
	Green Ridge MDWCA	130	32	0	5
Rio Grande (Middle)	Tranquillo Pines Water System [e]	375	52	0	22
	Bernalillo County public water supply totals	695		0	40
	County-wide public water supply per capita use [d]		51		
Estancia Rio Grande (Middle) Sandia	Rural Self-Supplied Homes (Rio Grande)	5,602	100	0	627
	Bernalillo County domestic self-supplied totals	5,602		0	627
	County-wide domestic self-supplied per capita use [d]		100		

Source: Longworth et al., 2013, unless otherwise noted.

[a] Determined based on NMED Drinking Water Bureau water supply source locations (NMOSE water use database doesn't distinguish groundwater basin).

[b] Rural self-supplied homes are shown for specified surface water basin in parenthesis.

[c] The Thunder Mountain Water System, located in Santa Fe County, imports water from the town of Estancia in Torrance County; this withdrawal and population is reported under the Estancia water system (Longworth et al., 2013).

[d] County-wide per capita use, calculated as the total population divided by total withdrawals

[e] Portion that is in Estancia Basin planning region

gpcd = Gallons per capita per day

Table 6-4 2010 Water Withdrawals for Drinking Water Supply Systems and Rural Self-Supplied Homes

OSE Declared Groundwater Basin(s) [a]	Water Supplier [b]	Population	Per Capita Use (gpcd)	Withdrawals (acre-feet)	
				Surface Water	Groundwater
Torrance County					
Estancia	Carlos Lucero Subdivision - Gilbert Lucero	75	50	0	4
	Cassandra Water System	54	80	0	5
	Clines Corners Water System	40	368	0	16
	Echo Valley Water Co.	408	79	0	36
	Edgewood Meadows Water Co-Op	100	62	0	7
	EPCOR/New Mexico American Water Co Edgewood District [c] - part	1,081	114	0	138
	Estancia, Town of	2,200	138	0	341
	Indian Hills Water Company	460	80	0	41
	Manzano MDWCA	95	43	0	5
	Melody Ranch Water Co	193	81	0	18
	Moriarty Water System	1,763	266	0	525
	Mountainair	1,600	125	0	224
	Punta De Agua MDWCA	50	80	0	4
	Squaw Valley Water Supply System	216	80	0	19
	Sunset Acres Subdivision	300	63	0	21
	Tajique MDWCA	181	102	0	21
	Torreon MDWCA	150	23	0	4
	Willard Water Supply System	210	91	0	21

Source: Longworth et al., 2013, unless otherwise noted.

[a] Determined based on NMED Drinking Water Bureau water supply source locations (NMOSE water use database doesn't distinguish groundwater basin).

[b] Rural self-supplied homes are shown for specified surface water basin in parenthesis.

[c] The Thunder Mountain Water System, located in Santa Fe County, imports water from the town of Estancia in Torrance County; this withdrawal and population is reported under the Estancia water system (Longworth et al., 2013).

[d] County-wide per capita use, calculated as the total population divided by total withdrawals

gpcd = Gallons per capita per day

Table 6-4. 2010 Water Withdrawals for Drinking Water Supply Systems and Rural Self-Supplied Homes

OSE Declared Groundwater Basin(s) [a]	Water Supplier [b]	Population	Per Capita Use (gpcd)	Withdrawals (acre-feet)	
				Surface Water	Groundwater
Torrance County (cont.)					
Fort Sumner	Encino Water System	100	126	0	14
NA	Duran Water System	70	76	0	6
	Homestead Estates	230	156	0	40
	Pine Canyon Ranch	1,366	80	0	122
	Torrance County public water supply totals	10,942		0	1,634
	County-wide public water supply per capita use [d]		133		
Fort Sumner Roswell Upper Pecos	Rural self-supplied homes (Pecos)	109	80	0	10
Estancia Fort Sumner Rio Grande (Middle) Roswell Tularosa Upper Pecos	Rural self-supplied homes (Rio Grande)	5,329	80	0	477
	Torrance County domestic self-supplied totals	5,438		0	487
	County-wide domestic self-supplied per capita use [d]		80		

Source: Longworth et al., 2013, unless otherwise noted.

[a] Determined based on NMED Drinking Water Bureau water supply source locations (NMOSE water use database doesn't distinguish groundwater basin).

[b] Rural self-supplied homes are shown for specified surface water basin in parenthesis.

[d] County-wide per capita use, calculated as the total population divided by total withdrawals

gpcd = Gallons per capita per day

For the Jemez y Sangre region, current per capita use in Rio Arriba and Santa Fe counties is under 130 gpcd (Table 6-4), so no additional conservation is assumed. Los Alamos County currently has per capita use between 200 and 300 gpcd (Table 6-4), so their future per capita use is assumed to be reduced to 150 gpcd. In the projection, this reduction is phased in over time.

The per capita demand for the residential sector only (without commercial, governmental, or other sectors) ranges from 40 to 242 gallons per capita per day (gpcd) with an average of 77 gpcd for the 64 public systems within the region (Lewis et al., 2013). Calculated per capita water demand based on water conserving technology and average area landscaped varied from 69.8 gpcd for Los Alamos to 76 gpcd for Santa Fe and 86.1 gpcd for Española. Using these target values, the region has the potential to save about 1,000 ac-ft/yr if all public water systems are able to reduce demand to less than the target.

Self-supplied domestic. Homeowners with private wells can achieve water savings through household conservation measures. Most of these wells are not metered, unless connected to more than one household, and current water use estimates were developed based on a relatively low per capita use assumption (Table 6-4; Longworth et al., 2013). Therefore, no additional conservation savings were assumed in developing the water demand projections. For purposes of developing projections, a county-wide per capita rate was calculated as the total self-supplied domestic use in the county divided by the total county population (or portion of the county within the region), excluding those served by a public water system.

However, for 141 metered domestic wells connected to 191 homes in the Jemez y Sangre Water Planning Region the median per capita demand was found to be 112 gpcd (based on the annual usage and 2010 Census data by block group), which is about 50 percent greater than the per capita demand from public water systems. After examining the landscaped area associated with each home (using GIS and aerial imagery), the water necessary to irrigate the landscape of each home was calculated and compared. Implementing conservation technology to continue irrigating existing turf and replacing indoor fixtures resulted in an estimated savings of 1,870 acre-feet out of the current demand of 5,640 acre-feet that serves about 43,500 people in the region (Lewis et al., 2013).

Irrigated agriculture. As the largest water use in the region, conservation in this sector may be beneficial. However, when considering the potential for improved efficiency in agricultural irrigation systems, it is important to consider how potential conservation measures may affect the region's water supply.

Withdrawals in both surface and groundwater irrigation systems include both consumptive and non-consumptive uses and incidental losses:

- Consumptive use occurs when water is permanently removed from the system due to crop evapotranspiration (i.e., evaporation and transpiration). Evapotranspiration is

determined by factors that include crop and soil type, climate and growing season, on-farm management, and irrigation practices.

- Non-consumptive use occurs when water is temporarily removed from the stream system for conveyance requirements and is returned to the surface or groundwater system from which it was withdrawn.
- Incidental losses from irrigation are irrecoverable losses due to seepage and evapotranspiration during conveyance that are not directly attributable to crop consumptive use.
    - Seepage losses occur when water leaks through the conveyance channel or below the root zone after application to the field and is either lost to the atmosphere or remains bound in the soil column.
    - Evapotranspiration occurs as a result of (1) evaporation during water conveyance in canals or with some irrigation methods (e.g., flood, spray irrigation) and (2) transpiration by ditch-side vegetation.

Some agricultural water use efficiency improvements (commonly referred to as agricultural water conservation) reduce the amount of water diverted, but may not reduce depletions or may even have the effect of increasing consumptive use per acre on farms (Brinegar and Ward, 2009; Ward and Pulido-Velazquez, 2008) . These efforts can result in economic benefits, such as increased crop yield, but may have the adverse effect of reducing return flows and therefore downstream water supply. For example, methods such as canal lining or piping may result in reduction of seepage losses associated with conveyance, but that seepage will no longer provide return flow to other users. Other techniques such as drip irrigation and center pivots may reduce the amount of water diverted, but if the water saved from such reductions is applied to on-farm crop demands, water supplies for downstream uses will be reduced.

Due to the complexities in agricultural irrigation efficiency, no quantitative estimates of savings are included in the projections. However, the regions are encouraged to explore strategies for agricultural conservation, especially those that result in consumptive use savings through changes in crop type or fallowing of land while concentrating limited supplies for greater economic value on smaller parcels. Section 8 outlines strategies developed by the Jemez y Sangre steering committee to achieve savings in agricultural water use within the region.

Self-supplied commercial, industrial, livestock, mining, and power. Conservation programs can be applicable to these sectors, but since insufficient information is available for these sectors within the region, no additional conservation savings are assumed in the water demand projections.

Annual water diversions for self-supplied commercial systems total 1,400 ac-ft/yr from groundwater and 430 ac-ft/yr from surface water. Only 42 of the 136 systems have recent diversion data; thus the actual use may be much different. The type and size of commercial systems would need to be examined to explore the possibility for water savings through conservation. Likewise, the commercial use for business supplied by public water systems would also need to be examined on a case-by-case basis (i.e., for a hotel, how many rooms, what is the vacancy rate, how much water is used compared to what could be used to meet the needs of the business).

Reservoir evaporation. In many parts of New Mexico, reservoir evaporation is one of the highest consumptive water uses, but in the Jemez y Sangre region no reservoir evaporation is reported, as the NMOSE only tracks reservoirs that are greater than 5,000 acre-feet. There is some reservoir evaporation from the smaller reservoirs in the region, but because it is not tracked by NMOSE, it is not shown on the projections. To reduce usage in this category, some areas outside of the region have considered aquifer storage and recovery to replace some reservoir storage, and it may also be possible in some circumstances to gain some reduction in evaporation by storing more water at higher elevations or constructing deeper reservoirs with less surface area for evaporation. However, due to the legal, financial, and other complexities of implementing these techniques, no conservation savings are assumed in developing the reservoir evaporation demand projections for this region.

6.5 Projections of Future Water Demand for the Planning Horizon

To develop projections of future water demand a consistent method was used statewide. Section 6.5.1 provides a comprehensive discussion of the methods applied consistently throughout the state to project water demand in all the categories reported in the *New Mexico Water Use by Categories* reports, and some of the categories may not be applicable to the Jemez y Sangre region. The projections of future water demand determined using this consistent method, as applicable, for the Jemez y Sangre region are discussed in Section 6.5.2.

6.5.1 Water Demand Projection Methods

The *Handbook* provides the time frame for the projections; that is, they should begin with 2010 data and be developed in 10-year increments (2020, 2030, 2040, 2050, and 2060). Projections will be for withdrawals in each of the nine categories included in the *New Mexico Water Use by Categories 2010* report (Longworth et al., 2013) and listed in Section 6.1.

To assist in bracketing the uncertainty of the projections, low- and high-water demand estimates were developed for each category in which growth is anticipated, based on demographic and economic trends (Section 6.2) and population projections (Section 6.3), unless otherwise noted. The projected growth in population and economic trends will affect water demand in eight of the nine water use categories; the reservoir evaporation water use category is not driven by these factors.

The 2010 administrative water supply (Section 5.5.1) was used as a base supply from which water demand was projected forward. As discussed in Section 5.5, the administrative water supply is based on withdrawals of water as reported in the *New Mexico Water Use by Categories 2010* report, which provide a measure of supply that considers both physical supply and legal restrictions (i.e., the water is physically available for withdrawal, and its use is in compliance with water rights policies) and thus reflects the amount of water available for use by a region.

The assumptions and methods used statewide to develop the demand projections for each water use category follow. Not all of these categories are applicable to every planning region. The specific methods applied in the Jemez y Sangre region are discussed in Section 6.5.2.

Public water supply includes community water systems that rely on surface water and groundwater diversions other than from domestic wells permitted under 72-12-1.1 NMSA 1978 and that consist of common collection, treatment, storage, and distribution facilities operated for the delivery of water to multiple service connections. This definition includes municipalities (which may serve residential, commercial, and industrial water users), mutual domestic water user associations, prisons, residential and mixed-use subdivisions, and mobile home parks.

For regions with anticipated population increases, the increase in projected population (high and low) was multiplied by the per capita use from the *New Mexico Water Use by Categories 2010* report (Longworth et al., 2013) (reduced for conservation as specified above), times the portion of the population that was publicly supplied in 2010 (calculated from Longworth et al., 2013); the resulting value was then added to the 2010 public water supply withdrawal amount. Current surface water withdrawals were not allowed to increase above the 2010 withdrawal amount unless there is a new source of available supply (i.e., water project or settlement). Both the high and low projections incorporated conservation for counties with per capita use above 130 gpcd, as discussed in Section 6.4, on the assumption that some of the new demand would be met through reduction of per capita use.

For planning purposes, in counties where a decline in population is anticipated (in either the high or low scenario or both), as a conservative approach it was assumed that public water supply would remain constant at 2010 withdrawal levels based on the 2010 administrative water supply (the water is physically available for withdrawal, and its use is in compliance with water rights policies). Likewise, in regions where the population growth is initially positive but later shows a decline, the water demand projection was kept at the higher rate for the remainder of the planning period.

The *domestic (self-supplied)* category includes self-supplied residences with well permits issued by the NMOSE under 72-12-1.1 NMSA 1978 (Longworth et al., 2013). Such residences may be single-family or multi-family dwellings. High and low projections were calculated as the 2010 domestic withdrawal amount plus a value determined by multiplying the projected change in population (high and low) times the domestic self-supplied per capita use from the *New Mexico*

Water Use by Categories 2010 report (Longworth et al., 2013) times the calculated proportion of the population that was self-supplied in 2010 (calculated from Longworth et al., 2013). In counties where the high and/or low projected growth rate is negative, the projection was set equal to the 2010 domestic withdrawal amount. This allows for continuing use of existing domestic wells, which is anticipated, even when there are population declines in a county. In regions where the population growth is initially positive but later shows a decline, the water demand projection was kept at the higher level for the remainder of the planning period, based on the assumption that domestic wells will continue to be used even if there are later population declines.

The *irrigated agriculture* category includes all withdrawals of water for the irrigation of crops grown on farms, ranches, and wildlife refuges (Longworth et al., 2013). To understand trends in the agricultural sector, interviews were held with farmers, farm agency employees, and others with extensive knowledge of agriculture practices and trends in each county. Additionally, the New Mexico agriculture census data for 2007 and 2012 were reviewed and provided helpful agricultural data such as principal crops, irrigated acreage, farm size, farm subsidies, and age of farmers (USDA NASS, 2014). Comparison of the two data sets shows a downward trend in the agricultural sector across New Mexico from 2007 to 2012. This decline was in all likelihood related at least in part to the lack of precipitation in 2012: in most of New Mexico 2007 was a near normal precipitation year (ranging from mild drought to incipient wet spell across the state), while in 2012 the PDSI for all New Mexico climate divisions indicated extreme to severe drought conditions. Based on the interviews, economic factors are also thought to be a cause of the decline.

In much of the state, recent drought and recession are thought to be driving a decline in agricultural production. However, that does not necessarily indicate that there is less demand for water. In areas where irrigation is supplied by surface water, there are frequent supply limitations, with many ditches having no or limited supply later in the season. This results in large fluctuations in agricultural water use and productivity from year to year. While it is possible that drought will continue over a longer term, it is also likely that drought years will be interspersed with wetter years, and there is some potential for renewed agricultural activity as a result. With infrastructure and water rights in place, there is a demand for water if it becomes available.

In regions that use surface water for agriculture withdrawals, the 2010 administrative water supply used as the starting point for the projections reflects a near normal water year for the region. For the 2020 through 2060 projections, therefore, it was generally assumed that the surface water demand is equal to the 2010 administrative water supply for both the high and low scenarios. Even if some farmers cease operations or plant less acreage, the water is expected to be used elsewhere due to surface water shortages. Conversely, if increased agricultural activity

is anticipated, water demand in this sector was still projected to stay at 2010 administrative water supply levels unless there is a new source of available supply (i.e., water project or settlement).

In areas where 10 percent or more of groundwater withdrawals are for agriculture and there are projected declines in agricultural acreage, the low projection assumes that there will be a reduced demand in this sector. The amount of decline projected is based on interviews with individuals knowledgeable about the agricultural economy in each county (Section 6.2). Even in areas where the data indicate a decline in the agricultural economy, the high projection assumes that overall water demand will remain at the 2010 administrative water supply levels since water rights have economic value and will continue to be used.

The *livestock* category includes water used to raise livestock, maintain self-supplied livestock facilities, and support on-farm processing of poultry and dairy products (Longworth et al., 2013). High and low projections for percentage growth or declines in the livestock sector were developed based on interviews with ranchers, farm agency employees, and others with extensive knowledge of livestock trends in each county (Section 6.2). The growth or decline rates were then multiplied by the 2010 water use to calculate future water demand.

The *commercial (self-supplied)* category includes self-supplied businesses (e.g., motels, restaurants, recreational resorts, and campgrounds) and public and private institutions (e.g., public and private schools and hospitals) involved in the trade of goods or provision of services (Longworth et al., 2013). This category pertains only to commercial enterprises that supply their own water; commercial businesses that receive water through a public water system are not included. To develop the commercial self-supplied projections, it was assumed that commercial development is proportional to other growth, and the high and low projections were calculated as the 2010 commercial water use multiplied by the projected high and low population growth rates. In regions where the growth rate is negative, both the high and low projections were assumed to stay at the 2010 administrative supply water level, based on water rights having economic value. In regions where the population growth is initially positive but later shows a decline, the water demand projection will remain at the higher level for the remainder of the planning period, again based on the administrative water supply and the value of water rights. . This method may be modified in some regions to consider specific information regarding plans for large commercial development or increased use by existing commercial water users.

The *industrial (self-supplied)* category includes self-supplied water used by enterprises that process raw materials or manufacture durable or nondurable goods and water used for the construction of highways, subdivisions, and other construction projects (Longworth et al., 2013). To collect information on factors affecting potential future water demand, economists conducted interviews with industrial users and used information from the New Mexico Department of Workforce Solutions (2014) to determine if growth is expected in this sector. Based on these interviews and information, high and low scenarios were developed to reflect ranges of possible

growth. If water use in this category is low and limited additional use is expected, both the high and low projections are the same.

The *mining* category includes self-supplied enterprises that extract minerals occurring naturally in the earth's crust, including solids (e.g., potash, coal, and smelting ores), liquids (e.g., crude petroleum), and gases (e.g., natural gas). Anticipated changes in water use in this category were based on interviews with individuals involved in or knowledgeable about the mining sector. If water use in this category is low and limited additional use is expected, both the high and low projections are the same.

The *power* category includes all self-supplied power generating facilities and water used in conjunction with coal-mining operations that are directly associated with a power generating facility that owns and/or operates the coal mines. Anticipated changes in water use in this category were based on interviews with individuals involved in or knowledgeable about the power sector. If water use in this category is low and limited additional use is expected, both the high and low projections are the same.

Reservoir evaporation includes estimates of open water evaporation from man-made reservoirs with a storage capacity of approximately 5,000 acre-feet or more. The amount of reservoir evaporation is dependent on the surface area of the reservoir as well as the rate of evaporation. Evaporation rates are partially dependent on temperature and humidity; that is, when it is hotter and drier, evaporation rates increase. Surface areas of reservoirs are variable, and during extreme drought years, the low surface areas contribute to lower total evaporation, even though the rate of evaporation may be high.

The projections of reservoir evaporation for each region were based on evaporation rates reported in the *Upper Rio Grande Impact Assessment* (USBR, 2013), which evaluated potential climate change impacts in New Mexico. This report predicted considerable uncertainty, but some increase in evaporation rates and lower evaporation totals overall due to predicted greater drought frequency and resultant lower reservoir surface areas. Although it is possible that total evaporation will be lower in drought years, since the projections are to be compared to 2010 use, assuming lower reservoir evaporation would give a false impression of excess water. Thus, the low projection assumes 2010 evaporation amounts. For the high projection, the same surface areas as 2010 were assumed, but higher evaporation rates, derived from the *Upper Rio Grande Impact Assessment* (USBR, 2013), were used to reflect potentially warmer temperatures. The high scenario projected using this approach represents a year in which there is a normal amount of water in storage but the evaporation rates have increased due to increasing temperatures.

In reality the fluctuations in reservoir evaporation are expected to be much greater than the high/low range projected using this method. To evaluate the balance between supply and demand, the projections are being compared to the administrative water supply, including reservoir evaporation. It is important to not show an unrealistic scenario of excess available

water. Therefore the full range starting with potentially very low reservoir surface areas was not included in the projections.

6.5.2 Jemez y Sangre Projected Water Demand

Table 6-5 summarizes the projected water demands for each water use category for each of the three counties, which were developed by applying the methods discussed in Section 6.5.1. As discussed in Section 6.3, population is projected to increase in Santa Fe County under both the low and high scenarios, with substantial population increase expected under the high scenario. In Rio Arriba and Los Alamos counties, population is expected to increase slightly under the high scenario, and to initially increase slightly in 2020 and then to decrease slightly under the low scenario. The total projected water demand in the county in 2060 ranges slightly, from 94,463 to 104,034 acre-feet per year. Surface water supplies may be considerably lower in drought years, as discussed in Section 5.5.2, but the demand for water does not necessarily decrease when the supply is diminished.

Demand in the *public water supply* category is projected to increase in all three counties under the high scenario and in Santa Fe County under the low scenario, proportional to the increasing population projections. Under the low scenario, population in Rio Arriba and Los Alamos counties is expected to initially go up in 2020 and then to decline to below current levels. However, use in this category is not projected to decline proportionally to the projections indicating declining population, because it is anticipated that existing water rights and domestic wells will continue to be used at the 2010 administrative supply level.

Projected water demand in the *commercial* and *domestic* categories is assumed to be proportional to the population growth rates. The high projection shows anticipated increases in all three counties. The low projections assume current levels of use for the domestic and commercial categories in Rio Arriba and Los Alamos counties, with increases expected in Santa Fe County.

No water is currently used in Los Alamos County for *agricultural irrigation*, and that is not expected to change. In Rio Arriba and Santa Fe counties, it is likely that the current observed declining trend for agriculture will continue for the short term. However, the current drought and recent recession are thought to be driving the decline, and it would therefore not be prudent to assume declining demand for agricultural water in the long-term future. While it is possible that drought will continue over a longer term, it is also likely that drought years will be interspersed with wetter years, and there is some potential for renewed agricultural activity as a result. With the history of agricultural surface water use in the region and amount of irrigated land, there is clearly a demand for agricultural water if it is available. Hence, it is assumed that agriculture will begin to slowly recover. For the projections through 2060, water use in this category is projected to remain constant at 2010 levels, assuming that there will be a demand for all of the surface water that is available. In other words, the lack of use in recent years is based on supply limitations, rather than a lack of demand for the water.

Table 6-5. Projected Water Demand, 2020 through 2060
Jemez y Sangre Water Planning Region

Use Sector	Projection	Water Demand (acre-feet) [a]					
		2010 [b]	2020	2030	2040	2050	2060
Rio Arriba County [c]							
Public water supply	High	1,395	1,564	1,808	2,070	2,346	2,633
	Low	1,395	1,418	1,418 [d]	1,418 [d]	1,418 [d]	1,418 [d]
Domestic (self-supplied)	High	1,364	1,528	1,767	2,023	2,293	2,573
	Low	1,364	1,386	1,386 [d]	1,386 [d]	1,386 [d]	1,386 [d]
Irrigated agriculture	Low/High	47,316	47,316	47,316	47,316	47,316	47,316
Livestock (self-supplied)	Low/High	23	11	17	23	23	23
Commercial (self-supplied)	High	434	486	562	643	729	818
	Low	434	441	441 [d]	441 [d]	441 [d]	441 [d]
Industrial (self-supplied)	Low/High	0	0	0	0	0	0
Mining (self-supplied)	Low/High	546	0	0	0	0	0
Power (self-supplied)	Low/High	0	0	0	0	0	0
Reservoir evaporation	Low/High	0	0	0	0	0	0
Los Alamos County							
Public water supply	High	4,065	4,497	4,626	4,700	4,720	4,757
	Low	4,065	4,073	4,073 [d]	4,073 [d]	4,073 [d]	4,073 [d]
Domestic (self-supplied)	Low/High	0	0	0	0	0	0
Irrigated agriculture	Low/High	0	0	0	0	0	0
Livestock (self-supplied)	Low/High	0	0	0	0	0	0
Commercial (self-supplied)	Low/High	0	0	0	0	0	0
Industrial (self-supplied)	Low/High	0	0	0	0	0	0
Mining (self-supplied)	Low/High	0	0	0	0	0	0
Power (self-supplied)	Low/High	0	0	0	0	0	0
Reservoir evaporation	Low/High	0	0	0	0	0	0
Santa Fe County [c]							
Public water supply	High	12,397	13,065	14,629	16,248	17,860	19,398
	Low	12,397	12,728	13,451	14,141	14,783	15,360
Domestic (self-supplied)	High	2,297	2,494	2,954	3,431	3,906	4,359
	Low	2,297	2,394	2,607	2,811	3,000	3,170

[a] Tribes and pueblos in New Mexico are not required to provide water use data to the State. Therefore, tribal water use data are not necessarily reflected in this table.

[b] Actual withdrawals (Longworth et al., 2013)

[c] Portion of the county within the planning region

[d] Projected future water demand set equal to 2020 decade high.

Table 6-5. Projected Water Demand, 2020 through 2060
Jemez y Sangre Water Planning Region
Page 2 of 2

Use Sector	Projection	Water Demand (acre-feet) [a]					
		2010 [b]	2020	2030	2040	2050	2060
Santa Fe County [c] (cont.)							
Irrigated agriculture	Low/High	18,818	18,818	18,818	18,818	18,818	18,818
Livestock (self-supplied)	Low/High	88	44	66	88	88	88
Commercial (self-supplied)	High [d]	1,689	1,921	2,238	2,567	2,894	3,206
	Low	1,689	1,760	1,915	2,064	2,202	2,326
Industrial (self-supplied)	Low/High	0	0	0	0	0	0
Mining (self-supplied)	High	45	260	45	45	45	45
	Low	45	45	45	45	45	45
Power (self-supplied)	Low/High	0	0	0	0	0	0
Reservoir evaporation	Low/High	0	0	0	0	0	0
Total region							
Public water supply	High	17,857	19,126	21,063	23,018	24,927	26,787
	Low	17,857	18,218	18,941	19,632	20,274	20,851
Domestic (self-supplied)	High	3,660	4,022	4,721	5,454	6,199	6,932
	Low	3,660	3,780	3,993	4,196	4,385	4,555
Irrigated agriculture	Low/High	66,134	66,134	66,134	66,134	66,134	66,134
Livestock (self-supplied)	Low/High	111	55	83	111	111	111
Commercial (self-supplied)	High	2,122	2,407	2,800	3,210	3,623	4,024
	Low	2,122	2,201	2,356	2,505	2,643	2,767
Industrial (self-supplied)	Low/High	0	0	0	0	0	0
Mining (self-supplied)	High	592	260	45	45	45	45
	Low	592	45	45	45	45	45
Power (self-supplied)	Low/High	0	0	0	0	0	0
Reservoir evaporation	Low/High	0	0	0	0	0	0
Total regional demand	High	90,477	92,004	94,847	97,972	101,039	104,034
	Low	90,477	90,433	91,552	92,623	93,592	94,463

[a] Tribes and pueblos in New Mexico are not required to provide water use data to the State. Therefore, tribal water use data are not necessarily reflected in this table.

[b] Actual withdrawals (Longworth et al., 2013)

[c] Portion of the county within the planning region

[d] Additional estimated use for Santa Fe Downs and Horse Park added to high projection.

The *livestock* segment in Rio Arriba and Santa Fe counties is expected see a steep decline by 2020, but to recover to 100 percent of 2010 water usage by 2040. Some ranches could go out of business because younger people, who do not view ranching as a desirable or economically viable career choice, will not replace the older generation of ranchers.

No water is currently used directly for *industrial* activities or *power* plants within the region and none is expected in the future.

Most of the *mining* water use in the region has been at the mica mine and mill at Velarde in Rio Arriba County. Because the mine has closed and the site purchased by Picuris Pueblo, it is expected that there will be no further mining or milling in Rio Arriba County in the future, and no mining is anticipated in Los Alamos County. Under the high scenario, it is projected that the Ortiz gold mine will open in eastern Santa Fe County, on the south side of the Ortiz Mountains, and will use 215 acre-feet per year during the 10-year expected life of the mine. Under the low projection, use is expected to stay at the 2010 level of 45 acre-feet per year.

The Jemez y Sangre region projections do not include water use in the *reservoir evaporation* category because there are no reservoirs greater than 5,000 acre-feet, which is the minimum capacity for tracking by NMOSE (Longworth et al., 2013). The detailed subregion water budgets provided in the 2003 plan (DBS&A and Lewis, 2003) estimate projected reservoir evaporation from the small reservoirs in the region.

7. Identified Gaps between Supply and Demand

Estimating the balance between supply and demand requires consideration of several complex issues, including:

- Both supplies and demands vary considerably over time, and although long-term balanced supplies may be in place, the potential for drought or, conversely, high flows and flooding must be considered. In general, storage, including the capture of extreme flows for future use, is an important aspect of allowing surface water supplies to be used when needed to meet demand during drought periods (i.e., reservoir releases may sustain supplies during times when surface water supplies are inadequate).

- In wet years when more water is available than in 2010, irrigators can increase surface water diversions up to their water right and reservoirs will fill when inflow exceeds downstream demand, provided that compact requirements are satisfied, to increase storage for subsequent years. Thus, though not quantified, the withdrawals in wet years may be greater than the high projection.

- Municipalities have the ability to hold water rights for future use; thus the amount of water use in 2010 may not reflect the water supply portfolio available to a particular

public water system. Some public water systems may be at their capacity to meet demand and some may have planned for growth; without a thorough review of all water rights for each system, the exact supply-demand gap is not known.

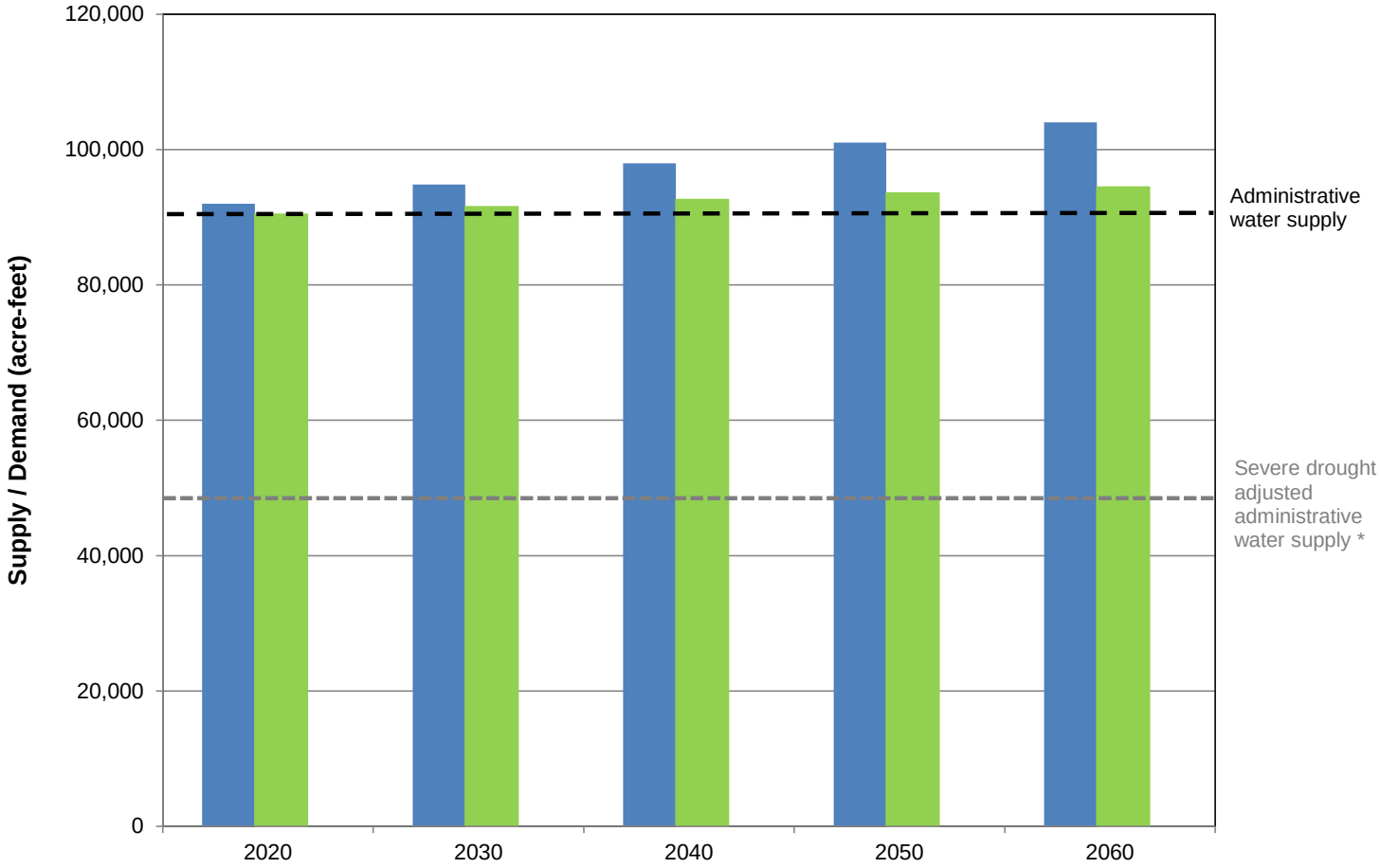
- Supplies in one part of the region may not necessarily be available to meet demands in other areas, particularly in the absence of expensive infrastructure projects. Therefore comparing the supplies to the demands for the entire region without considering local issues provides only a general picture of the balance.

- As discussed in Section 4, there are considerable legal limitations on the development of new surface and groundwater resources, given that surface water and surface-connected groundwater supplies are fully appropriated, which affects the ability of the region to prepare for shortages by developing new supplies.

- Besides quantitative estimates of supply and demand, numerous other challenges affect the ability of a region to have adequate water supplies in place. Water supply challenges include the need for adequate funding and resources for infrastructure projects, water quality issues, location and access to water resources, acquisition of water rights to offset stream impacts, limited productivity of certain aquifers, and protection of source water.

Despite these limitations, it is useful to have a general understanding of the overall balance of the supply and demand. Figure 7-1 illustrates the total projected Jemez y Sangre regional water demand under the high and low demand scenarios, and also shows the administrative water supply and the drought-adjusted water supply. As presented in Section 5.5, the region's administrative water supply is 90,477 acre-feet and the drought supply is 48,391 acre-feet, or about 53 percent of a normal year administrative water supply. The high water demand projection reflects substantial growth in Santa Fe County and slight growth in Rio Arriba and Los Alamos counties (Figure 7-1). The low projection reflects more moderate growth in Santa Fe County and fairly steady water use in Rio Arriba and Los Alamos counties.

Because of its reliance on surface water, the region has a very high degree of vulnerability to drought. That vulnerability is tempered to some degree by the supplemental water provided to certain entities by the San Juan-Chama Project. The estimated shortage in drought years is expected to range from 46,072 to 55,640 acre-feet over the planning period, primarily impacting the agricultural sector. Consequently, increasing storage, developing shortage-sharing agreements, and protecting watershed health for the region's surface water supplies, are high priorities for the region. The conjunctive use programs that the City and County of Santa Fe have implemented are important for mitigating drought impacts; addressing drought contingency planning for other surface water uses is also important.



* Based on the ratio of the minimum drought of record to the 2010 administrative water supply.

Note: Tribes and pueblos in New Mexico are not required to provide water use data to the State. Therefore, tribal water use data are not necessarily reflected in this figure.

Figure 7-1

JEMEZ Y SANGRE
REGIONAL WATER PLAN 2016

Available Supply and Projected Demand

8. Implementation of Strategies to Meet Future Water Demand

An objective of the regional water planning update process is to identify strategies that will help the region to balance the gap between supply and demand and address other future water management challenges, including infrastructure needs, protection of existing resources and water quality, and the need to maximize limited resources through water conservation and reuse. The Jemez y Sangre Water Planning Council (JySWPC) considered a variety of strategies for addressing these water management challenges. As discussed in Sections 5 and 7, the water supply in the region is limited by both water rights constraints and physical constraints, particularly during drought periods.

This RWP builds on the 2003 water plan and considers strategies that will enhance and update, rather than replace, the strategies identified in the 2003 water plan. The status of the strategies from the previous regional water plan is assessed in Section 8.1. Additional strategies recommended in this RWP update—including a comprehensive list of projects, programs, and policies, key collaborative projects, and recommendations for the state water plan—are included in Section 8.2 and Appendix 8-A. Details of some of the past projects are provided in Appendix 8-B, and strategies that have already begun to close the supply-demand gap are analyzed in Section 8.1 and Appendix 8-C.

8.1 Implementation of Strategies Identified in Previously Accepted Regional Water Plan

An important focus of the RWP update process is to both identify strategies and processes and consider their implementation. To help address the implementation of new strategies, a review of the implementation of previous strategies was first completed.

The 2003 *Jemez y Sangre Regional Water Plan* categorized the alternatives into five categories to help clarify which alternatives could be used to address the projected gap between supply and demand and which would address the sustainability of the existing supplies. Alternatives in Categories I through III addressed actions that will potentially protect existing supplies for existing demands, including the environment, while those in Categories IV and V addressed the projected gap between supply and demand by either reducing the projected demand or increasing the supply. While some of the actions under Categories I through III might actually increase the amount of "wet water," they would not provide new water rights to close the gap between supply and demand. Table 8-1 (and Appendices 8-B1 and 8-B2) lists the actions taken under each of the recommended alternatives. The alternatives recommended to address the protection of existing supplies included:

Table 8-1. Implementation Status of Strategies Identified in Accepted Plan Jemez y Sangre Basin Water Planning Region

Strategy	Status / Action Taken
Category I: Protect Existing Supplies	
Forest restoration project	• USFS:13 restorations projects funded by CFRP, totaling $4,500,000 (Appendix 8-B for details) • NMED Section 319:12 funded watershed restoration projects in Jemez y Sangre(Appendix 8-B for details) • City of Santa Fe has thinned more than 4,700 acres. • Los Alamos County, Pajarito Watershed Association • Pojoaque Pueblo • Santa Clara Pueblo • Santa Fe County, Santa Fe Watershed Association, Forest Guardians, State Land Office • San Ildefonso Pueblo • Ohkay Owingeh • Tesuque Pueblo • Post-Fire Restoration of the Rito de los Frijoles at Bandelier National Monument Visitors' Center • Rio Grande Corridor at Buckman Phase II
Develop storm water management ordinance	• Santa Fe County (as part of Subdivision Ordinance) • City of Española • City of Santa Fe • New Mexico State Land Office • Los Alamos County • Cerro Gordo Ditch Association • Hyde Park Water Users Association
Cloud seeding project	• Research and workshops, need funding for pilot project
Develop well field management plan	• OSE not developing critical management area (CMA) in Jemez y Sangre region. • City of Santa Fe has well field management plan. • Pojoaque Pueblo rotates use of wells. • Eldorado Area Water and Sanitation District (WSD) has a plan. • City of Española • Solacito Mutual Domestic Water Association developed wellhead protection project. • Hyde Park Water Users Association (WUA). • Los Alamos County will consider addressing plume migration

Table 8-1. Implementation Status of Strategies Identified in Accepted Plan Jemez y Sangre Basin Water Planning Region

Strategy	Status / Action Taken
Category I: Protect Existing Supplies (cont.)	
Propose conjunctive use of surface and groundwater supplies	• City of Santa Fe preferably uses surface water when it is available. • La Puebla Community Well Association • Santa Fe County working on plan (Buckman Direct Diversion [BDD] combined with wells). • Eldorado Area WSD is working with Santa Fe County to acquire surface water. • Los Alamos County has Los Alamos Reservoir surface water rights that have not been used after fire damage. The reservoir is now being rebuilt for nonpotable uses. With San Juan-Chama (SJC) diversion, the County will have additional options. • Parties to Aamodt Settlement Agreement will have options for conjunctive use once a diversion from the Rio Grande is built.
Expand treatment facilities to remove trace constituents (i.e., arsenic)	• City of Española developed arsenic abatement plan to blend water from wells to reduce arsenic levels. • City of Santa Fe has conducted wellhead treatment at several wells and applied for a 3-year extension for compliance with the new arsenic standard to explore arsenic treatment options.
Restrict drilling of domestic wells within your jurisdiction	• City of Española • City of Santa Fe • County of Santa Fe • La Vista Homeowners Association • Hyde Park WUA • OSE has new domestic well regulations that reduce allowed water use.
Develop/explore methods for instream flow	• Santa Cruz • Pojoaque Pueblo • Santa Fe County is exploring the potential for Valle Vista treatment plant to discharge to Arroyo Hondo and revitalize La Cienega. • City of Santa conducted a tree-ring study to analyze longer historical period of streamflow. • City of Santa Fe releases reservoir water to help restore the Santa Fe River. • NMED Clean Water Act Section 319 Watershed Restoration Action Strategies (WRASs) (see Appendix C for summary of WRASs)

Table 8-1. Implementation Status of Strategies Identified in Accepted Plan Jemez y Sangre Basin Water Planning Region

Strategy	Status / Action Taken
Category I: Protect Existing Supplies (cont.)	
Wastewater treatment plant construction, repairs, or upgrades	• PL 108-354 (entitled Chimayo Water Supply System and Española Filtration Facility Act) requires feasibility study of regional system. • Pojoaque Pueblo upgrading wastewater treatment plant (WWTP) from lagoons to Class A treatment. • Española upgrading WWTP from 0.96 million gallons per day (mgd) to 2.2 mgd. • Los Alamos County completed upgrade of WWTP (1.4-mgd design flow). • El Vadito de los Cerrillos MDWCA • Rio Arriba County Commission is looking into a regional wastewater treatment plant. • Santa Fe County received $850,000 grant to address wastewater treatment in Sombrillo area.
Acéquia bylaws to prevent water transfers out of acéquia	• Santa Cruz Irrigation District has completed bylaws for 14 acéquias in the district. • La Acéquia de la Canada Ancha passed bylaws. • Acéquia Madre • Rio Arriba County has hired a liaison to assist acéquias in developing bylaws. • Cerro Gordo Ditch Association • New Mexico Acéquia Association
Protect agriculture	• Santa Fe County Agriculture Revitalization Initiative-Transferable Development Rights Program
Category II: Improve System Efficiency	
Wastewater reuse project	• City of Santa Fe has reused effluent since the 1940s and will continue to do so. • Pojoaque Pueblo reuses wastewater and will use more after new plant is constructed. • Santa Fe County • Los Alamos County • Tesuque Pueblo uses effluent from casino to irrigate landscaping.
Project to replace septic tanks and provide for regional WWTP	• Santa Clara Pueblo and City of Española exploring possibilities for collaborating on a WWTP. • Santa Fe County looking into regional WWTP.
Line irrigation ditches/acéquias	• Santa Clara has lined all ditches. • San Ildefonso has lined all ditches. • Cerro Gordo Ditch Association

Table 8-1. Implementation Status of Strategies Identified in Accepted Plan
Jemez y Sangre Basin Water Planning Region
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Strategy	Status / Action Taken
Category II: Improve System Efficiency (cont.)	
Develop a regional water system authority	• Eldorado Area WSD provides water service to 22 area communities. • BDD Project Board is a regional authority for the one source of supply as of August 2006. • Los Alamos County Water Utility is a regional water system for Los Alamos, White Rock, Bandelier, and Los Alamos National Laboratory (LANL). • Aamodt parties created a Regional Water Authority oversee the proposed Pojoaque Basin Regional Water System
Aquifer storage and recovery project	• Santa Fe County may consider using treated effluent and surface water.
Optimize reservoir management (sediment removal, evaporative loss reduction)	• Project funded to restore Santa Cruz Reservoir, including raising dam and dredging. • Santa Clara Pueblo removed sediment from ponds that were inundated after the Cerro Grande fire. • City of Santa Fe conducted bathymetry study of McClure and Nichols and built new outlet structures, may seek carryover storage agreement in Heron Reservoir. • El Vadito de los Cerrillos MDWA has repaired Cerrillos Reservoir dam.
Changes to infrastructure	• Santa Clara Pueblo is replacing old infrastructure. • Pojoaque Pueblo is improving infrastructure, adding booster stations, pipelines, and storage tanks. • Eldorado Area WSD has made significant improvements and additions to its water system infrastructure over the past decade and has developed a Utility Master Plan to guide future changes. • Solacito completed new storage tank project, needs more repairs and upgrades. • City of Santa Fe water treatment plant capacity is now 8 mgd; storage capacity has also been increased. • Los Alamos County is replacing 50-year-old pipes. • El Vadito de los Cerrillos MDWA has installed a new water line extension and 100,000-gallon tank. • Parties to Aamodt will make changes to infrastructure associated with surface diversion and wells. • Galisteo MDWCA replacing storage tanks and pipelines.
Groundwater modeling studies	• Santa Clara Pueblo (groundwater model for Superfund site) • Santa Fe County • City of Santa Fe • Los Alamos/LANL • Eldorado Area WSD • BIA

Table 8-1. Implementation Status of Strategies Identified in Accepted Plan
Jemez y Sangre Basin Water Planning Region
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Strategy	Status / Action Taken
Category II: Improve System Efficiency (cont.)	
Water audits	• Santa Fe County • La Puebla Community Well Association • City of Santa Fe (looking at non-revenue water) • Eldorado Area WSD
Leak detection and repair	• Eldorado Area WSD. • City of Santa Fe • La Puebla Community Well Association • Los Alamos County conducts leak detection and repair program every 5 years. • El Vadito de los Cerrillos MDWA
Aquifer injection	• City of Santa Fe potential option for offsetting impacts of Buckman well pumping on La Cienega. • Rancho Viejo tests to explore potential of injecting water to offset impacts of pumping. • The City of Santa Fe is working with the Bureau of Reclamation to evaluate ASR as part of a suite of options for the reuse of treated wastewater
Drill replacement wells	• Pojoaque Pueblo will add wells for redundancy. • City of Española will drill four new wells if funded. • Hyde Park WUA • Santa Fe County • City of Santa Fe • Chupadero Water-Sewage Corp. • Los Alamos County (if SJC direct diversion is delayed or potential contamination is an issue) • El Vadito de los Cerrillos MDWCA drilled supplemental well in 2003. • Madrid Water Cooperative • Eldorado Area WSD
Transfer indoor water use associated with domestic wells to utility system	• Rio Arriba County actively involved in developing legislation to assist mutual domestics, which provides for transfers of the inside portion of domestic wells into community systems.
Category III: Mitigate Drought	
Water banking/temporary leases of water rights	• Santa Cruz Irrigation District • Acéquia Madre • El Vadito de los Cerrillos

Table 8-1. Implementation Status of Strategies Identified in Accepted Plan
Jemez y Sangre Basin Water Planning Region
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Strategy	Status / Action Taken
Category III: Mitigate Drought (cont.)	
Emergency conservation ordinance to restrict water use	• Pojoaque Pueblo sends out letters if water supply is insufficient. • Santa Clara gives instructions to tribal members. • City of Santa Fe has an ordinance. • Eldorado Area WSD has a policy. • City of Española has an ordinance. • La Vista Homeowners' Association • Santa Fe County • Los Alamos County • El Vadito de los Cerrillos MDWA • San Ildefonso Pueblo
Shortage sharing agreements (acéquias)	• Santa Cruz Irrigation District has a sharing agreement (Hollaman Decree). • La Puebla Community Well Association • Santa Clara Pueblo has an informal agreement with non-tribal members. • City of Santa Fe has a delivery obligation with Santa Fe County; i.e., in the event of a BDD shortage, the City will deliver water from the Buckman wells. • *San Juan-Chama Project water contains shortage sharing provisions of the federal authorizing legislation (http://bddproject.org/history/san-juan-chama-project/)*
Category IV: Reduce Demand	
Manage growth and land use	• Santa Fe County has minimum lot size, requirement to show water availability for 100 years. • City of Santa Fe requires that new demand for new growth be offset either with toilet retrofits or purchase of water rights. • Rio Arriba manages growth for open space, but doesn't restrict growth. • San Marcos maintains minimum lot size. • El Vadito de los Cerrillos MDWA • Madrid Water Cooperative has moratorium on new water system connections.

Table 8-1. Implementation Status of Strategies Identified in Accepted Plan
Jemez y Sangre Basin Water Planning Region
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Strategy	Status / Action Taken
Category III: Mitigate Drought	
Water conservation focused on outdoor use	• Eldorado Area WSD (conservation plan) • City of Española • San Marcos • Solacito MDWCA • Hyde Park WUA • Santa Fe County • City of Santa Fe conservation plan addresses fugitive water, requires swimming pool covers, identifies acceptable vegetation; drought stages triggered by reservoir levels and demand. • Los Alamos County • El Vadito de los Cerrillos (proposed) • San Ildefonso Pueblo restricts use of potable water for use on gardens or car washing.
Water conservation focused on indoor use for new construction	• Eldorado Area WSD has conservation plan. • City of Española • Solacito MDWCA • Hyde Park WUA • Santa Fe County (including hot water recirculation ordinance) • City of Santa Fe (growth allowed through toilet retrofits) • El Vadito de los Cerrillos (proposed)
Water conservation focused on indoor use through retrofits	• Hyde Park WUA • City of Santa Fe
Water harvesting (rooftop)	• Santa Fe County (new construction >2,500-ft^2 roof area) • San Marcos, Hyde Park WUA City of Santa Fe provides rebates for rain barrels and cisterns

Table 8-1. Implementation Status of Strategies Identified in Accepted Plan
Jemez y Sangre Basin Water Planning Region

Strategy	Status / Action Taken
Category III: Mitigate Drought (cont.)	
Rate structure incentive for water conservation	• Eldorado Area WSD has a tiered rate structure to encourage conservation as well as a summer rate surcharge. • City of Española • City of Santa Fe (March 2008) • La Vista Home Owners Association • Hyde Park WUA • Santa Fe County has inclining rate structure. • Los Alamos County (proposed) • El Vadito de los Cerrillos increased rates in 2003. • Pueblos do not charge fee for water use by members of tribe.
Gray water harvesting	• Hyde Park WUA • City of Santa Fe
Rebates or other incentives to reduce demand	• City of Santa Fe
Wastewater reuse	• Santa Fe County • City of Santa Fe • Pojoaque Pueblo to increase use of wastewater effluent on golf course. • Los Alamos County needs more storage. • Of the 1,045 acres of turf in the Jemez y Sangre region, 77% are irrigated with effluent, raw river water or are artificial turf (Lewis et al., 2013)
Category V: Increase Water Supply	
Use San Juan-Chama water	• City of Española uses SJC water for offsets on pumping; options for surface diversion being evaluated. • City/County Santa Fe: BDD completed 2011; contract for SJC with U.S. Bureau of Reclamation is now permanent. • Los Alamos County working through EIS for diversion of SJC water through deep wells. • The Aamodt Settlement includes diversion of 1,079 acre-feet of SJC water

Table 8-1. Implementation Status of Strategies Identified in Accepted Plan
Jemez y Sangre Basin Water Planning Region
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Strategy	Status / Action Taken
Category V: Increase Water Supply (cont.)	
Acquire and transfer groundwater rights to increase water supply.	• City of Española • Solacito MDWCA • Chupadero Water-Sewage Corp. • New Mexico State Land Office • County of Santa Fe
Acquire and transfer surface water rights to increase water supply.	• Rio Arriba County considering acquisition. • Aamodt Settlement includes transfer of Top of the World Water Rights to the Pojoaque Valley Regional Water System • Eldorado Area WSD interested. • City of Española • Chupadero Water-Sewage Corp. • New Mexico State Land Office • County of Santa Fe (from Socorro, Peña Blanca) • City of Santa Fe • Water Right Transfer Ordinance (WRTO) 2005
Transfer water rights across the Otowi Gage	• Currently not allowed by NMOSE.
Use new domestic wells (72-12-1) for future growth	• Santa Fe County trying to discourage the number of domestic wells by having large minimum lot size.
Drill additional municipal wells for future growth	• Santa Clara Pueblo • Pojoaque Pueblo • Eldorado Area WSD • Chimayo • Hyde Park WUA • Santa Fe County • City of Santa Fe drilled five new Buckman wells. • El Vadito de los Cerrillos drilled supplemental well for emergency use; seeking permanent use. • Galisteo MDWCA drilled new well.
Reappropriate water above Otowi Gage up to 1929 conditions of the Rio Grande Compact	• Santa Fe County issued Notice of Intent, may pursue if NMOSE indicates that water is available.

Table 8-1. Implementation Status of Strategies Identified in Accepted Plan Jemez y Sangre Basin Water Planning Region

Strategy	Status / Action Taken
Category V: Increase Water Supply (cont.)	
Appropriate flood flows during years when excess is available on the Rio Grande	• None reported
Build new reservoirs	• None reported
Brackish water desalinization	• Santa Fe County has considered proposals from Estancia Basin. • Small businesses working with LANL on deep well drilling project. • El Vadito de los Cerrillos MDWA (proposed)
Increase water supply by obtaining return flow credits	• Santa Clara Pueblo • Pojoaque Pueblo will consider. • City of Española • City of Santa Fe • Santa Fe County • Acequias, support policy to allow credit for acequia return flow and aquifer recharge, not only in adjudication
Interbasin transfer	• None currently proposed aside from SJC diversion

- Category I: Protect Existing Supplies and the Environment
    1. Watershed restoration and protection
    2. Enhanced recharge through stormwater management
    3. Pilot cloud seeding project
    4. Pursue sustainable management of water resources through better understanding of hydrogeology-improved regional model
    5. Establish critical management areas to manage domestic wells
    6. Develop conjunctive use strategies
    7. Appropriate flood flows (when Elephant Butte is spilling)
    8. Remove trace contaminants through local or regional water treatment systems
    9. Address septic tank water quality degradation
    10. Clean up contaminated groundwater and surface water through increased funding to NMED
    11. Continue funding programs to protect surface water and groundwater
    12. Support restoration of stream reaches to their designated uses
- Category II: Improve System Efficiency
    13. Wastewater reuse
    14. Encourage rainwater collection
    15. Line irrigation ditches
    16. Remove sediment in Santa Cruz Reservoir and investigate Nambe Reservoir
    17. Repair leaks in water systems
    18. Consider aquifer storage and recovery of excess water (treated effluent or flood flows)
    19. Pursue increased storage capacity in Abiquiu Reservoir
- Category III: Address Drought
    20. Develop drought contingency plans (develop triggers, analyze vulnerability, adopt mitigation measures)

Alternatives recommended to address the supply-demand gap were:

- Category IV: Reduce Projected Demand
  21. Pursue water conservation
  22. Pursue growth management
- Category V: Increase Water Supply
  23. Utilize San Juan-Chama Project (SJC) water (Ohkay Owingeh, Los Alamos County, Española, City and County of Santa Fe)
  24. Transfer water rights through consensus process
  25. Limited use of domestic wells

The steering committee reviewed each of the strategies and indicated that they are all still relevant, with the exception of cloud seeding, and some are being refocused as new recommended strategies (Appendix 8-A). Actions that have been completed in order to implement the strategies identified in the 2003 plan are summarized on Table 8-1.

8.1.1 Estimate of Reduction in Projected Gap between Supply and Demand from the 2003 Jemez y Sangre Regional Water Plan

Many of the alternatives outlined in Section 8.1 have been implemented, resulting in a reduction in the supply-demand gap projected in the Jemez y Sangre 2003 RWP. By analyzing the reduction in water use through adjustments to the projected growth, conservation efforts, transfers of water rights, new domestic wells, and use of San Juan-Chama water, the overall gap in water supply and demand in 2060 for the non-agricultural sector, as projected in the 2003 RWP, has been reduced by 41 percent.

- The conservation savings achieved in just ten years was estimated to reduce the projected supply-demand gap in 2060 by 6,400 ac-ft/yr.
- Growth management (or growth correction) reduced the demand gap by 2,400 acre-feet per year.
- An estimated 1,570 new wells increased the water provided by over 500 acre-feet.
- Transfers of 2,600 acre-feet of water rights from agriculture to non-agricultural uses closed the gap by 8 percent.
- San Juan-Chama Project water and Nambe Pueblo reserved rights applied to the Aamodt settlement reduces the supply-demand gap by almost 1,400 ac-ft/yr, or about 4 percent.

Details of the calculations used to determine the reduction in the supply-demand gap are provided in Appendix 8-C.

Although the agricultural sector is by far the largest water user in the region, alternatives to reduce demand in this category were not developed in the 2003 plan for several reasons. First, no new demands were envisioned for the agricultural category in the 2003 plan and thus the projected gap is focused on the non-agricultural sector. Second, most of the agricultural water use is derived from tributaries to the Rio Grande that are historically short in meeting agricultural demands; thus any conservation efforts would likely be applied to meeting current demand. Finally, methods to improve agricultural efficiency (i.e., canal lining) in this water planning region do not appear to "save" water. The reason for this is that improving irrigation efficiency may result in increased depletions and a reduction in return flow (Brinegar and Ward, 2009; Ward and Pulido-Velazquez, 2008). Return flow is often a water supply for a downstream water user; thus agricultural water conservation often does not reduce the gap in supply and demand.

8.2 Conservation

The 2003 water plan focused on the conservation potential for public water systems because the projected public (non-agricultural) categories' gap between supply and demand is highly sensitive to improvements in conservation. Conservation by new and existing public water system customers could result in potential water savings of approximately 15 to 30 percent for indoor use and 40 to 50 percent for outdoor use. Since beginning to pursue municipal water conservation in earnest in the early 2000s, per capita usage has dropped by as much as 30 percent, a greater margin than anticipated, resulting in diminished total demand despite increasing population. The conservation savings achieved in just ten years was estimated to reduce the projected supply-demand gap in 2060 by 6,444 ac-ft/yr for the Jemez y Sangre region, a reduction of 14 percent. Table 8-1 lists the projects aimed at improving system efficiency, all of which have helped to reduce the regions per capita demand.

8.3 Strategies for Meeting Regional Water Needs

In addition to continuing with most of the strategies from the 2003 plan (with the exception of cloud seeding), the JySWPC discussed and compiled new project, program and policy (PPP) information, identified key collaborative projects, and provided recommendations for the state water plan. Projects identified in the 2003 plan, such as water conservation, continue to be supported by the region.

The recommendations made by the steering committee and other stakeholders have not been evaluated or approved by NMISC. Regardless of the NMISC's acceptance of this RWP, inclusion of these recommendations in the plan shall not be deemed to indicate NMISC support for, acceptance of, or approval of any of the recommendations, PPP information, and collaborative strategies included by the regional steering committee and other stakeholders.

8.3.1 Comprehensive Table of Projects, Programs and Policies

Stakeholders were asked to provide information regarding PPPs that they wanted to see implemented. A summary of that information is included in Appendix 8-A.

Over the two-year update process, eight meetings were held with stakeholders in the Jemez y Sangre planning region. These meetings identified the program objectives, presented draft supply and demand calculations for discussion and to guide strategy development, and provided an opportunity for stakeholders to provide input on the PPPs that they would like to see implemented (Section 2). A summary of the PPP information, obtained primarily from input supplied directly by stakeholders, is provided in Appendix 8-A. Information was requested during several open meetings. Requests for input were also e-mailed to all stakeholders who had expressed interest in the regional water planning process. Because some water projects were already identified through the Infrastructure Capital Improvement Plan (ICIP) process, those projects are also included in the PPP list.

The information in Appendix 8-A has not been ranked or prioritized; it is an inclusive table of all of the PPPs that regional stakeholders are interested in pursuing. It includes projects both regional in nature (designated R in Appendix 8-A) and those that are specific to one system (designated SS in Appendix 8-A). The table identifies each PPP by category, including water and wastewater system infrastructure, water conservation, watershed management, flood prevention, water reuse, water rights, water quality, and others.

In the Jemez y Sangre region, projects identified on the PPP list are primarily water system infrastructure, irrigation system upgrades, and watershed restoration projects.

8.3.2 Key Projects for Regional Collaboration

It is recognized that prioritizing projects for funding is done by each funding agency/program, based on their current criteria, and that projects are reviewed in comparison to projects from other parts of the state. Consequently, the regional water planning update program did not attempt to rank or prioritize projects that are identified in Appendix 8-A. However, identifying larger regional collaborative projects is helpful to successful implementation of the regional plan. At the Jemez y Sangre Water Planning Committee meetings held in 2015 and 2016, the group discussed projects that would have a larger regional or subregional impact and for which there is interest in collaboration with entities in other water planning regions to seek funding and for implementation.

Key collaborative projects identified by the Jemez y Sangre Water Planning Committee and stakeholders are shown on Table 8-2. The projects include:

Table 8-2. Key Collaborative Programs, Projects, and Policies
2016 Jemez y Sangre Regional Water Plan
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Project Description	Project Lead	Project Partners	Probable Funding Source(s)	Cost Range	Major Implementation Issues
Rio Grande Water Fund-Watershed Restoration					
Protect surface water supplies for Rio Grande Watershed communities (the region from Albuquerque upstream to the Colorado border and the headwaters of the San Juan-Chama Project) with the intent of bringing diverse stakeholders together in a collaborative effort to plan projects and raise money for the purposes of wildfire prevention, source water protection and post-fire mitigation.	The Nature Conservancy	• USFS • NM State Forestry • NM State Land Office • NMED • NM Interstate Stream Commission • Pueblos • Municipalities • BLM • Environmental advocacy groups • Private landowners • Industry • Agriculture	• Private foundations • State • Local municipalities • Water Trust Board • NM Finance Authority • USFS • EPA	$15 M/year	While most New Mexicans understand that watershed restoration is important to protect water supply, convincing downstream water users and elected officials to spend money on project upstream will be a challenge.

Table 8-2. Key Collaborative Programs, Projects, and Policies
2016 Jemez y Sangre Regional Water Plan
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Project Description	Project Lead	Project Partners	Probable Funding Source(s)	Cost Range	Major Implementation Issues
Mapping Regional Climate Resiliency					
To prioritize and assess vulnerability due to climate change and to prioritize restoration efforts at a regional landscape level. Part 1: Gather Data into GIS, create a visual representation of the landscape that shows which areas have received forest restoration, areas of forest fires and the burn severity, riparian restoration (e.g. bank stabilization), impermeable pavement, FEMA flood areas, and other information to help managers assess the most vulnerable locations and prioritize the restoration efforts. Part 2: Prepare a 5 to 10 year plan for implementation.	Jemez y Sangre Watershed Subcommittee	• City of Santa Fe • Santa Fe County • LANL • Rio Arriba County • USFS • NMED • State Forestry • Soil Conservation Districts • USGS • All About Watersheds • New Mexico's Forest and Watershed Health Information Clearinghouse	• NMED • LANL • City of Santa Fe • County of Santa Fe • Bureau of Reclamation	$50,000 to $1,000,000	Restoration efforts throughout NM remain fragmented. At a statewide regional landscape level a major deterrent to implementation will be to coordinate stakeholders and data currently available. Project receives widespread support, but requires an agency to coordinate the effort.

Table 8-2. Key Collaborative Programs, Projects, and Policies
2016 Jemez y Sangre Regional Water Plan
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Project Description	Project Lead	Project Partners	Probable Funding Source(s)	Cost Range	Major Implementation Issues
Española Basin Groundwater Model					
Build a numerical model of the Española Basin through a collaborative process where stakeholders participate in defining model boundaries, layers, parameters and calibration process. A trusted groundwater model is the basis for managing the water resources in the region.	NMOSE	• City of Santa Fe • Santa Fe County • Bureau of Reclamation • Pueblos • City of Espanola • Los Alamos County	• City of Santa Fe • County of Santa Fe • LANL • Special appropriation	$500,000? Plus in-kind contributions of partners	Building stakeholder involvement and NMOSE support are at issue with regard to support
Regional Water Supply Monitoring					
Consolidate multiple monitoring plans into a single strategy for assessing the groundwater resources of the region and supporting the calibration of a groundwater model.	Española Basin Technical Advisory Group (EBTAG)	• USGS • City of Santa Fe • Santa Fe County • NMOSE • NMED • BIA • NMBGMR	• WTB • NMED • USGS • Local government	$50,000/year	Currently, multiple agencies (USGS, NMED, City and counties) are monitoring the same wells. With collaboration, the resources could be used more wisely improve resource management. Widespread support for this project which could be applied statewide.

Table 8-2. Key Collaborative Programs, Projects, and Policies
2016 Jemez y Sangre Regional Water Plan
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Project Description	Project Lead	Project Partners	Probable Funding Source(s)	Cost Range	Major Implementation Issues
Protect Local Agriculture					
Any projects proposed by acequias, farmers, or local governments with the purpose of supporting the agricultural community, such as improving farming infrastructure, irrigation efficiency, exploring or protecting native crops that are resilient to the local climate, and supporting farm-to-table initiatives	Santa Fe County	• Acequia Associations • Acequia Commission • Santa Fe City/County Food Policy Council • Nueves Acequias Associations • Sustainable Santa Fe Commission	• Santa Fe County • City of Santa Fe	TBD (Current support of $50K/yr for Food Policy Council)	
Consolidate Mutual Domestic Resources as Appropriate					
Consolidate Mutual Domestic Water Consumers Associations into a regional water association for the purpose of consolidating operation and maintenance services, financial, administrative, procurement, as well as water right acquisition from private domestic wells.	• Alfredo Montoya • Martha Graham • Anna Hamilton	• Mutual Domestic and other rural public water systems • NMED	• USDA • NM Finance Authority • NMED • Self- funding)	$25,000/year	Sensitive issue that will have to be implemented with care. Critical in developing this project is the ability for each public water system to retain historic water rights, the systems autonomy and their integrity as a traditional community. Cost to members would likely increase to pay for increased services.

Table 8-2. Key Collaborative Programs, Projects, and Policies
2016 Jemez y Sangre Regional Water Plan

Project Description	Project Lead	Project Partners	Probable Funding Source(s)	Cost Range	Major Implementation Issues
Santa Fe Basin Regional Water Authority Evaluation					
Evaluate how Santa Fe City and County Water and Wastewater utilities (and some small public water systems) could combine into a regional water system governed by an authority. The geographical area would most likely include the Santa Fe Sub-region	• Kathy Holian, SF County • Peter Ives, City of Santa Fe	• Santa Fe County • City of Santa Fe • Some PWSs	• City/County • Legislature	In-kind costs	Wide support by Santa Fe County, but no support in the City water utility. It is unknown whether City councilors support this idea or not. A major obstacle is the lack of support by the City Utility. The State Legislature might become involved as was the case with the Bernalillo Regional Water Authority

Table 8-2. Key Collaborative Programs, Projects, and Policies
2016 Jemez y Sangre Regional Water Plan
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Project Description	Project Lead	Project Partners	Probable Funding Source(s)	Cost Range	Major Implementation Issues
Planning for Resilience and Restoration in the Greater Santa Fe Fireshed					
Develop and deliver NEPA-ready products to the Espanola Ranger District and Tesuque Pueblo to expedite activities to reduce wildfire.	Forest Guild	• SFNF • Tesuque Pueblo • City of Santa Fe Water Utility and Fire Department • Santa Fe County Fire Department • University of Arizona Tree Ring Lab • USGS Jemez Field Station • Tesuque Valley Community Association • Wildfire Network • Santa Fe Fat Tire Society • State Forestry Bernalillo District • Santa Fe Watershed Association • Keystone Restoration Ecology • The Nature Conservancy • Wild Earth Guardians	• The Nature Conservancy Water Fund • Municipalities • State Forestry • USFS	$225,000 to prepare NEPA documents	Widespread acceptance for the overall project need, with the exception several vocal contrarians who make claims well outside the scientific consensus. Successful completion of this initiative will require extensive community education and outreach and careful adherence to NEPA requirements/process.

Table 8-2. Key Collaborative Programs, Projects, and Policies
2016 Jemez y Sangre Regional Water Plan
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Project Description	Project Lead	Project Partners	Probable Funding Source(s)	Cost Range	Major Implementation Issues
Prepare the Region to be more Resilient under Climate Change					
Projects that reduce the impact from climate change such as reducing water use, temporary leases of water from agriculture to urban use during drought, use reclaimed wastewater, improve ecosystem biodiversity, design or modify bridges and culverts, incorporate urban agriculture in water and land use planning, cultivate climate-appropriate crops, require pervious pavement, decentralize energy infrastructure, install solar panels over parking lots to reflect heat and produce energy, establish a climate-change target monitoring system.	City of Santa Fe	• Bureau of Reclamation • Santa Fe County	Bureau of Reclamation		

- Rio Grande Water Fund-Watershed Restoration
- Mapping Regional Climate Resiliency
- Española Basin Groundwater Model
- Regional Water Supply Monitoring
- Protect Local Agriculture
- Consolidate Mutual Domestic Resources as Appropriate
- Santa Fe Basin Regional Water Authority Evaluation
- Planning for Resilience and Restoration in the Greater Santa Fe Fireshed
- Prepare the Region to be more Resilient under Climate Change

The projects fall under the category of protect existing supplies and improving system efficiency. Projects for mitigating drought, expanding water conservation, and increasing supply are system-specific projects and are generally pursued independently.

Two of the collaborative projects are focused on reducing the risk of catastrophic wildfire (projects led by The Nature Conservancy and Forest Guild), which overlaps with the State Forestry Forest Action Plan. Our forested watersheds are the source of water for much of the state and a coordinated effort is needed to prioritize the treated areas, some of which are upstream in Colorado. One of the collaborative projects involves mapping the actions, including forest treatments and forest fires, to better understand the vulnerability of the landscape with regard to future climate changes. Mapping of areas where the landscape has been treated or modified (permeable pavement in parking lots, gabions and swales in arroyos, etc.) and those areas that are vulnerable to flooding (e.g., too small culverts) will help communities prioritize and increase the resiliency to climate change. The New Mexico Highlands University Natural Resource Management Department is compiling geographic information system (GIS) data on forest treatments in New Mexico (http://allaboutwatersheds.org/) that should serve as a starting point for making a map(s) of the region.

Two of the projects are focused on utilizing resources in a collaborative way to better understand the groundwater resources. The Española Basin Technical Advisory Group (EBTAG) was established in 2002 by NMOSE for the purpose of improving and sharing the knowledge of our water resources. EBTAG needs a leader to continue the effort and focus on both improving the groundwater modeling of the region and monitoring the resources in the most efficient manner. Currently, USGS, NMOSE, the City and County of Santa Fe, and Los Alamos County are monitoring some of the same wells. Through collaboration, more wells could be monitored with the existing resources. The Bureau of Indian Affairs has hired a contractor to develop a numerical model for a portion of the Española Basin, but stakeholders are not involved in that effort. Lack of agreement on the conceptual groundwater model, boundaries, and aquifer characteristics and stresses will prolong conflict in the region.

An ongoing collaborative project important to the region is the protection of local agriculture. This is important to the region in order to provide locally grown food (with minimal transportation costs), sustain the culture and beauty of the landscape, and provide economic vitality to the farming community. Thus, any projects proposed by acequias, farmers, or local governments with the purpose of supporting the agricultural community—such as improving farming infrastructure, exploring or protecting native crops that are resilient to the local climate, supporting farm-to-table initiatives, and collecting agricultural baseline data—are part of the Jemez y Sangre RWP.

The Jemez y Sangre Water Planning Region also supports any projects that help to prepare the region to be more resilient under climate change. Such actions include studies and recommendations in the recent Santa Fe Basin Study: *Adaptations to Projected Changes in Water Supply and Demand* (Llewellyn et al., 2015). These include (but are not limited to):

- Provide incentives and programs to reduce water use.
- Allow limited-term transfers of water from agriculture to urban use during drought.
- Augment potable water supplies with reclaimed wastewater.
- Improve ecosystem biodiversity.
- Manage and plan restoration holistically.
- Design or modify bridges and culverts to handle higher-intensity runoff events.
- Incorporate urban agriculture in water and land use planning.
- Cultivate climate-appropriate crops.
- Require pervious pavement, where appropriate.
- Decentralize energy infrastructure.
- Install solar panels over parking lots to reflect heat and produce energy.
- Establish a climate-change target monitoring system.

Finally, two of the projects, which may or may not be mutually exclusive, relate to consolidation of water systems. One of the projects involves combining small public water systems into a regional system where savings could be achieved through sharing operation and maintenance costs. The second project involves evaluating the possibility of combining the City and County of Santa Fe water systems into one water system. Santa Fe County is most interested in this project and may meet with resistance from the City of Santa Fe.

8.3.3 Key Program and Policy Recommendations

The legislation authorizing the state water plan was passed in 2003. This legislation requires that the state plan shall "integrate regional water plans into the state water plan as appropriate and consistent with state water plan policies and strategies" (§ 72-14-3.1(C) (10)). For future updates of the state water plan, NMISC has asked the regions to provide recommendations for larger programs and policies that would be implemented on a state level. These are distinct from the regional collaborative projects (Section 8.3.2, Table 8-2) and PPPs listed in Appendix 8-A, in that they would be implemented on a state, rather than a regional or system-specific level. The State will consider the recommendations from all of the regions, in conjunction with State-level goals, when updating the state water plan.

The JySWPC identified the following recommendations for State action:

- Improve the understanding of the predicted impacts from climate change to help in redesigning infrastructure (re-evaluate probable maximum precipitation values, etc.), identifying appropriate crops (that can withstand warmer temperatures, more intense rainfall and wind), protecting the landscape from the spread of invasive species (education and outreach on best approaches to identify and removing harmful vegetation), promoting gardening techniques that use less water and mitigating the impacts of earlier runoff of snowmelt (introduce beaver in high mountains to hold back water).

- Establish flood control districts where none exist to provide flood control projects with revenue from contracts, levy ad valorem taxes, or newly issued bonds to help prepare communities for high-intensity storm events.

- Support policy for protection of water rights from loss for non-use when placed in a conservation plan or an acequia water bank.

- Increase funding for the River Stewardship Program. This funding is available on a competitive grant basis from the Surface Water Quality Bureau of NMED for surface water restoration projects. This is on-the-ground funding with no match requirement. NMED is currently managing 12 projects around the state aimed at improved water quality, riparian health, and stream function, all of which are important for water quantity. Further, NMED uses this funding to satisfy a 40% matching requirement that must be met for the state to receive federal Clean Water Act section 319(h) funding, which is then provided to local user groups, individuals, and companies to develop watershed based plans. Once the watershed based plans are in place, those watersheds qualify for 319 on-the-ground project funding.

- Increase the budget available to the Monitoring, Assessment, and Standards (MASS) section of the Surface Water Quality Bureau to allow for more staff to conduct more surface water monitoring around the state. Right now, a staff of 6 is able to reach each surface water assessment unit (streams and lakes) in the state only once every eight years. These monitoring data form the basis for calculation of TMDLs of pollutants. A TMDL is the maximum amount of a given pollutant a stream or lake can tolerate before the water quality standards for that stream or lake are exceeded. More funding means more staff, which means more monitoring, which means more TMDLs and thus the basis to reduce pollutants in surface water so those waters meet state water quality standards.

- Adjudicate water rights. While AWRM helps alleviate critical water management issues in the near term, the lack of adjudication of water rights is a fundamental impediment to water rights administration and hinders timely and equitable reallocation of water in an efficient water market. Expedited water right transfers and greater certainty about water right validity and price in an efficient water market would benefit conventional water users and the environment. Adjudication of water rights will also help clarify consumptive use and return flow.

- To enable efficient and equitable transfers of water for environmental protection through water market transactions, the State should consider statutory and administrative measures to expedite transfers, protect water rights, and monitor compliance. In other western states, surface water and groundwater have been efficiently and equitably reallocated (either temporarily or permanently) for environmental purposes through water market transactions. These water markets are enabled by clear statutory provisions to protect water rights used for instream purposes, administrative procedures that allow for expedited water rights transfers, and water agency compliance monitoring. A recent review prepared for the National Fish and Wildlife Foundation assessed the enabling conditions for environmental water market transactions among western states, including New Mexico (Szeptycki, 2015). The review identified 10 legal elements necessary for environmental water markets and concluded that New Mexico had the following elements:

    - Recreation, fish, wildlife, and other ecological purposes recognized as beneficial uses in Attorney General Opinion.
    - Legality of transfers of existing water rights to instream uses recognized by Attorney General.
    - Availability of permanent instream flow transfers.
    - Express legal protection of conserved use under the Water Conservation Program.
    - Mechanism for registering informal forbearance deals and protecting rights from forfeiture.

The review also concluded that New Mexico is missing the following elements:

- No express statutory recognition of transfers of existing rights to instream uses.
- No expedited review for short-term environmental water transactions, except for emergency transactions.
- Limited geographic scope of instream flow rights: distinguish native and San Juan-Chama waters.
- Stacking of rights not available.
- It is unknown whether private parties can acquire instream flow water rights by transfer without losing the water right's priority date.
- Support energy sources that use less water (such as solar and wind). The power sector in New Mexico consumes over 58,000 ac-ft of water each year (Longworth, et al., 2013).

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Appendix 2-A

Master Stakeholder List

Jemez y Sangre Region 3 RWP Master Stakeholder List

Updated June 17, 2016

Last	First	Affiliation / Category
Aguilar	Terry	San Ildefonso Pueblo
Alarid	James	Los Alamos County
Anaya	Robert	County Commissioner, District 3, Santa Fe County Commission
Arena	Elise	Audubon
Armer	Tim	Executive Director, North Central New Mexico Economic Development District
Armijo	Myron	Tribal Liaison, OSE
Benavidez	David	NM Legal Services
Bent	Devin	
Blaine	Tom	NM State Engineer
Bokum	Conci	
Borchert	Claudia	SF County Utilities Division
Bordegaray	Angela	Interstate Stream Commission
Bosshardt	Brian	Deputy County Administrator Los Alamos County
Bove	Phil	Commissioner, Acequia Madre de Santa Fe
Brackley	Simon	President, SF Chamber of Commerce
Broennan	Felicity	Watershed Consultant
Buckley	R	
Buchser	John	Sierra Club
Burgess	Harry	Los Alamos County Manager
Bushnell	Darcy	Aamodt Public Outreach
Cale	Barbara	
Carpenter	Rick	City of Santa Fe
Cartron	Dominique	Daniel B. Stephens & Associates
Cash	Beverly Duran	Northern New Mexico Protects
C de Baca	Charlie	Acequia – La Cienega
Chakroff,	David	General Manager (member), El Dorado Water District
Chavarria	Ben	Director, Land & Water Rights, Santa Clara Pueblo
Chavarria	Dino	Santa Clara Pueblo
Chavez	Antonio	City of Espanola Water Utilities
Chavez	Margaret	Senior Environmental Scientist, Eight Northern Indian Pueblo Council, Inc.
Chavez	Miguel	County Commissioner, District 2, Santa Fe County
Chestnut	Peter	
Claffey	Tom	
Cooper	Jerry	El Dorado Water & San. District
Dickens	Carl	La Cienega

Note: Those interested in developing collaborative projects or ongoing planning efforts may contact the NMISC Regional Water Planning Manager for further information about the region's stakeholders.

Jemez y Sangre Region 3 RWP Master Stakeholder List

Updated June 17, 2016

Last	First	Affiliation / Category
Dixon	Deborah	
Dorame	Charlie	Tesuque Pueblo
Ellenberg	Richard D.	Center For Progress and Justice
Ely	Sandra	SF County Utilities
Erdmann	Andrew	City of Santa Fe Water Resources & Conservation
Esparsen	Joy	Intergovernmental Relations Director, New Mexico Association of Counties
Estrada-Lopez	Michelle	Pecos Basin US Bureau of Reclamation
Follingstad	Mary Helen	Terra Planning LLC
Fullerton	Reese	Consultant
Gallegos	Alonzo	La Bajada
Garcia	M	San Ildefonso Pueblo
Garcia	Mike	Rio Arriba County Planner
Geery	Emily	Manager, ISC Water Planning
Glasco	Timothy	Los Alamos County Utilities
Glime	Christen	Indian Health Service District Engineer, Santa Fe District Office Sanitation Facilities Construction Program
Gonzalez	Don Diego	Consultant, Water Resource Management Rio Arriba County
Gonzales	JJ	La Cienega Acequias
Gonzales	Javier	Mayor, City of Santa Fe
Gonzales	Pablo	PVID Commissioner
Gonzales	Thomas	NRCS
Graham	Martha	NM Rural Water Association, Source Water
Griego	Robert	SF County Planning Director
Griscom	David	SF County Economic Development
Haines	Todd	District Forester, NM State Forestry
Hamilton	Anna	Tetra Tech
Hanson	Anna	
Harrison	Ted	NM Community Foundation
Harwood	Kyle	Harwood Consulting, PC
Hay	Deanda	
Holian	Kathy	Commissioner, SF County Co-Chair JyS RWP
Hook	Allan	Sangre de Cristo Water Division

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Jemez y Sangre Region 3 RWP Master Stakeholder List

Updated June 17, 2016

Last	First	Affiliation / Category
Houser	Melissa	SF Conservation Trust
Hurlocker	Sanford “Sandy”	District Ranger, Espanola Ranger District, SF Natl. Forest
Ives	Peter N.	City Councilor District 2, City of Santa Fe Co-Chair JyS RWP
Jansens	Jan-Willem	Ecotone Conservation Planning
Jenkins	Jim	El Dorado Water District
Jervis	Tom	Audubon
Jones	Shannon	Buckman Direct Diversion Facility
Johnson	Jeff	
Kaufman	Greg	Implementation and Restoration Team Leader, NMED-Surface Water Quality Bureau
Keith	Kathy	Community Programs Director for LANL
Kelley	Michael	Public Works Director, Santa Fe County
Khalsa	Mukhtiar	Cuatro Villas Mutual Domestic Water Users Association
Kippenbrock	Randall	Executive Director, Santa Fe Solid Waste Authority
Kovacs	John	Geologist Consultant
Lewis	Amy	Hydrologist Consultant
Lindell	Signe	City Councilor, City of Santa Fe
Lithgow	Jason	NM State Lands Office
Lopez	Jose Varela	NM Forest Industry Association
Lucero	Alice	Mayor, City of Espanola
Lucero	Ed	PVID Chairman
Lucero	Ramon	Souder Miller
Lyons	Dale	Director of Freshwater Program, The Nature Conservancy
Madrid	Chris	Economic Development Director, Rio Arriba County
Maestas	Joseph	Councilor, City of Santa Fe
Marquez	Johnny	
Martinez	Alyn	Director, Pueblo of Pojoaque Tribal Works
Martinez	Cameron L.	Executive Director, Municipal Services, Pueblo of Pojoaque
Martinez	Peggy Sue	City Councilor- District 2, City of Espanola Co-Chair JyS RWP
Martinez	Ray	Environment Department, San Ildefonso Pueblo
Martinez	Stephen	Director, Natural Resources, Pueblo de San Ildefonso
McCarthy	Laura	Director of Conservation, The Nature Conservancy
Mee	William	President, Agua Fria Village Association
Miller	Hvtce	Santa Fe County Tribal Liaison
Mitchell	Mark	Governor, Pueblo of Tesuque

Note: Those interested in developing collaborative projects or ongoing planning efforts may contact the NMISC Regional Water Planning Manager for further information about the region’s stakeholders.

Jemez y Sangre Region 3 RWP Master Stakeholder List

Updated June 17, 2016

Last	First	Affiliation / Category
Mitchell	Toner	Trout Unlimited
Montoya	Alfredo	Las Nueve Acequias
Moore	Lucy	Lucy Moore & Associates
Mortimer	Katherine	Sustainable Santa Fe Programs Manager, City of Santa Fe
Nafey	Rebecca	Madrid Rural Water Coop
Neal	Dave	
Noftsker	Christina	Northern Rio Grande Water Rights OSE/ISC
Nordquist	Heather	Northern NM Protects
Nylander	Charlie	
Olafson	Paul	Santa Fe County Planner
O'Leary	Susan	
Orr	Bill	Acequia Ancon
Ortiz	Quita	City of Santa Fe
Otto	Andy	Executive Director, Santa Fe Watershed Association
Oweegon	Kathleen	Bridges of Peace
Padilla	Bernardine	Buckman Direct Diversion Project
Paryski	Paul	Sierra Club
Pegram	Page	ISC
Perez	Grace	Member of the City of Santa Fe Water Conservation Committee
Perez	Phillip	Governor, Pueblo of Nambe
Phillips	Larry	Director, Natural Resources Division, Ohkay Owingeh Pueblo
Puglisi	Alex	City of Santa Fe, Sangre de Cristo Water Company
		Pojoaque Valley Irrigation District Office
Richard	Stephanie Garcia	NM State Representative
Riseley-White	Hannah	ISC
Rivera	George	Pueblo of Pojoaque
Romero	Rosemary	Rosemary Romero Consulting
Roybal	Danny	PVID Commissioner
Roybal	Henry	SF County Commissioner District 1
Rudnick	Steven	
Ruiz	Carlos	OCCAM
Salazar	Ken	Santa Cruz Irrigation District
Sanchez	Lucia	Director of Planning, Rio Arriba County
Sauer	Selena	Law Student
Schrader	Richard	River Source

Note: Those interested in developing collaborative projects or ongoing planning efforts may contact the NMISC Regional Water Planning Manager for further information about the region's stakeholders.

Jemez y Sangre Region 3 RWP Master Stakeholder List

Updated June 17, 2016

Last	First	Affiliation / Category
Schiffbauer	Glenn	NM Green Chamber
Schmidt-Peterson	Rolf	ISC
Schoeppner	Jerry	Hydrologist, SF County
Sely	Sandra	SF County
Sherr	Elly	
Shuryn	Danielle	Sustainable Water Infrastructure Group (SWIG) Manager, NMED Drinking Water Bureau
Shanahan	Kim	Santa Fe Area Home Builders
Sill	Duncan	NCNMEDD
Squires	Anna	Deputy City Clerk, City of Espanola
Stefanics	Liz	County Commissioner District 5, Santa Fe County
Stoesz	Larry	
Stover	Sharon	Los Alamos County Clerk
Strathdee	Gavin	NMRWA Madrid Rural Water Coop
Stringer	Shann	Santa Fe Pojoaque SWCD
Stringer	Stephanie	NMED
Surgeon	Blanca	Rural Community Assistance Corporation
Swazo-Hinds	Ryan	Pueblo of Tesuque
Torres	David	NMED, Source Water Protection
Trujillo	David	Assistant County Manager, Rio Arriba County
Trujillo	Mark	Interim City Manager, Espanola
Trujillo	Martha	Northern NM Protects
Trujillo	Max O.	Outreach Coordinator, New Mexico Wildlife Federation
Trujillo	Steven	Espanola Public Works
Valdez	Levi	
Valentine	Lee	
Varela	Janice	New Mexico Acequia Commission
VeneKlasen	Garrett	NM Wildlife Federation
Vigil	Tim	Pojoaque Pueblo
Villarreal	Renee	Councilor, City of Santa Fe
Vokes	Charles	Buckman Direct Diversion Project
Walker	LizBeth	NRCS Santa Fe Service Center
White	Paul	Santa Fe Basin Water Association
Valentine	Lee	

Note: Those interested in developing collaborative projects or ongoing planning efforts may contact the NMISC Regional Water Planning Manager for further information about the region's stakeholders.

Jemez y Sangre Region 3 RWP Master Stakeholder List

Updated June 17, 2016

Last	First	Affiliation / Category
Winship	Shelley	Pojoaque Soil and Water Conservation District Quivira Coalition
Zeiler	Elizabeth	New Mexico Environment Department

Note: Those interested in developing collaborative projects or ongoing planning efforts may contact the NMISC Regional Water Planning Manager for further information about the region's stakeholders.

Appendix 2-B

Summary of Comments on Technical and Legal Sections (Single Comment Document) and Other Public Comments

Jemez y Sangre Regional Water Plan
Compilation of Comments on Draft Plan

No.	Commenter	Section	Page	Comment
1	City of Santa Fe	2. Public Involvement		It is the opinion of the City of Santa Fe ("City") that the planning process, in this instance, has been imposed on the City by the State and is being handled in a top-down fashion. This is most evident in the Public Involvement portion of the report which, while prominently featured, was composed after the majority of the report was written thereby ensuring that the comments, corrections, and concerns of the regional partners were not evident in the remainder of the document.
2	City of Santa Fe	3. Description of Planning Region		The preponderance of unregulated tribal entities within this region, who share in the primary water supply source, has significant implications on the usefulness of this plan. It seems that the description of the planning region would be a good place to note that the plan cannot and does not apply to the Northern Pueblos.
3	City of Santa Fe	4. Legal Issues		What is the purpose of the case summaries? None of the cases deal with either the State plan or Regional Plans. The cases are not relevant to the region, do not state the OSE's formal opinion and so isn't helpful. If information relevant to the planning process stems from a case, cite the case rather than a synopsis of the case.
4	City of Santa Fe	5. Water Supply		Better data is available for the Santa Fe River Basin through the BoR funded Basin Study Project
5	City of Santa Fe	5. Water Supply	52	While the plan recognizes that the City of Santa Fe has a desire to manage ground and surface water conjunctively (p.52), the common technical platform approach to quantifying water use based on the 2010 use does not address the fact that the city owns reserve water rights so that it can meet demand through either surface or groundwater production. The water rights in such a system are vital to the City's long range and emergency management strategies.
6	City of Santa Fe	6. Water Demand		While the report explains that only 7% of total regional surface water use is municipal, it also suggests that municipalities are where we should look to conserve. It is the position of the City that, given that greater than 1/3rd of all residents of the region live in the city and ~50% of the 2010 usage (4,900 of 10,006 af) in the city in 2010 comprised less than 7% of the total use in the area, the emphasis of the report on municipal conservation is inadequate to address the scale of the issue.
7	City of Santa Fe	Overarching		The plan does not address the needs of the region or its constituents.

Jemez y Sangre Regional Water Plan
Compilation of Comments on Draft Plan

No.	Commenter	Section	Page	Comment
8	City of Santa Fe	Overarching		The common technical platform ignores the unique conditions of the region hydrologically and demographically.
9	City of Santa Fe	Overarching		Assumptions about solutions are based, throughout the plan, on administrative realities rather than empirical ones to such an extent that it renders the plan unusable as a water management tool. For example, it is assumed that acquiring sufficient offsets would enable the city to realize its full demand, presumably on an annual basis, from groundwater without consideration of the actual availability of the resource. Also, domestic wells are pointed to as a way to meet future demand because they aren't regulated and therefore don't count toward municipal use even though they are serving the same citizens from an interconnected source. Furthermore, reservoir evaporation is not considered due to the elevation of the reservoirs
10	Santa Fe County	Overarching		The report quantifies water demand and supply for the region using the "common technical approach" in order to have a consistent method throughout the 16 planning regions. The report projects water demand over time based on demographic and economic trends and the method used to estimate supply is based on recent diversions. However, estimates of supply do not take into account climate change. Please include conclusions in the Santa Fe Basin Study related to anticipated decreases in precipitation and its effect on water supply
11	Santa Fe County	Overarching		Please add a section on the importance and potential options of reuse of treated wastewater as part of the solution for filling the gap between supply and demand from use for irrigation to potable supply and estimate how much it can replace fresh water
12	Santa Fe County	Overarching		Please add a section addressing watershed restoration and its relationship to improving water quality and quantity
13	Santa Fe County	Overarching		Please add a section on water harvesting for newly built homes as well as retrofitting existing homes
14	Santa Fe County	Overarching		Please add a section on regionalization; having a single operator of the water and wastewater system and the potential advantages and disadvantages
15	Santa Fe County	Overarching		Please include the pertinent conclusions of the Santa Fe Basin Study in the report, especially the anticipated effect on water supply over time

Jemez y Sangre Regional Water Plan
Compilation of Comments on Draft Plan

No.	Commenter	Section	Page	Comment
16	Santa Fe County	Overarching		Please add a section on the Buckman Direct Diversion focusing on major repairs required and how to obtain funding to help pay for them
17	Santa Fe County	Overarching		Please add a table and a map listing and locating permitted domestic wells in the Jemez y Sangre water planning region
18	Santa Fe County	Overarching		Please add a table listing permitted septic tanks in the Jemez y Sangre water planning region
19	Santa Fe County	4. Legal Issues	22	Revise language: "4. Non-Pueblo parties currently using domestic wells will ~~be given incentives~~ have the option to stop using groundwater and instead connect to the regional water system for their domestic water uses."
20	Santa Fe County	4. Legal Issues	22	Revise Language: "The system is to be funded by the United States, the State of New Mexico, and Santa Fe County, and will be overseen by a Regional Water Authority with representatives from the Pueblos and the County will operate the system. The portion of the system that will serve non-Pueblo water users in the basin will be funded paid for by the State and the County of Santa Fe and is currently projected to deliver up to about 1,500 ac-ft/yr, although this capacity may be reduced if the County determines that non-Pueblo demand for water from the system will be less."
21	Santa Fe County	4. Legal Issues	22	Revise Language: "By the objection filing deadline of April 7, 2015, more than 750 objections and nearly 400 acceptances had been filed. Briefing on the objections has been completed and the parties are waiting for a decision from the court. The deadline for filing acceptances has not yet been set by the court."
22	Santa Fe County	Section 4.1.5.5	25	The report mentions that the County has a conjunctive management plan which is correct but please clarify that the County does not have a program to implement it. Also, please mention that the County does not have back up wells but that regionalization could eliminate the need for them
23	Santa Fe County	5. Water Supply	35	Santa Fe Wildland Urban Interface program states the City of Santa Fe is the only entity involved. Please add that Santa Fe County also has a program
24	Santa Fe County	5. Water Supply	36	The report states that groundwater wells are responsible for groundwater elevation decreases in the La Cienega area. Please add that the County has taken steps to address the issue by replacing well use by serving customers with the County's water in the Valle Vista subdivision and the New Mexico State Penitentiary and a section of La Cienega

Jemez y Sangre Regional Water Plan
Compilation of Comments on Draft Plan

No.	Commenter	Section	Page	Comment
25	Santa Fe County	5. Water Supply	Table 5-7	The report lists the condition of dams in the region as being "poor". Please list who is responsible for each dam and group them by entity; e.g. Nambe Dan – Bureau of Reclamation
26	The Nature Conservancy	5. Water Supply		Thank you for including the Rio Grande Water Fund and its comprehensive plan for wildfire and water source protection in Section 5. This section would be further improved with a description of the surface water contribution from the various forested areas within the MRG. This information is already provided in the tables 5-4 and 5-5 and in figure 5-8, and could be summarized in a bullet.
27	The Nature Conservancy	5.1.2		Recent Climate Studies would be improved with a brief description of the effect of climate changes on wildfire timing, duration and severity, as this has a direct impact on forested areas that are important water sources. This data is already compiled in BOR Upper Rio Grande Impact Assessment http://www.usbr.gov/watersmart/wcra/reports/urgia.html.
28	The Nature Conservancy	5.3.1		Regional Hydrogeography or Section 5.3.2 Aquifer Conditions would be improved with a clearer description of the role of mountain front recharge to groundwater. This is important because of the possibility that these mountain fronts could undergo an ecological type conversion and/or burn in a high-severity wildfire, potentially changing infiltration and groundwater recharge.
29	The Nature Conservancy	5.4		Water Quality Assessment has a paragraph on impacts that does not include wildfire impacts, specifically post-fire, when rain falls on severely burned areas. The findings of a recent report by the USGS New Mexico Water Science Center analysing wildfire potential and the probability of post-fire debris flow for the Sandia and Manzano Mountains should be incorporated http://pubs.usgs.gov/sir/2014/5161/. In addition, a USGS study using the same methodology for the Jemez Mountains will be published in mid-2016 and could be incorporated before the Regional Water Planning deadline.

Jemez y Sangre Response to Public Comments on Draft Plan

May 2016

1. Comment From Devin Bent

   From: devin bent [mailto:devin.bent@gmail.com]
   Sent: Wednesday, May 18, 2016 7:16 PM
   To: Kathy S. Holian
   Subject: Opposition to transfer of water from agriculture to muncipalities

   Dear Commissioner Holian:
   We wish to record our opposition to the transfer of water from agriculture to municipalities as discussed in the DRAFT 2016 Jemez y Sangre Regional Water Plan.
   Santa Fe is a leader in a nation-wide agricultural renaissance which is promoting a healthier, more sustainable life style for all. Once water is transferred from agricultural uses, it will never come back and an opportunity is lost forever. We can find other, more environmentally methods of supplying water to municipalities.
   Thank you for your leadership in this matter. Devin and Judy Bent

Response to Comment 1:

In response to this comment, the Jemez y Sangre Water Planning Steering Committee added another project to our list of key projects to include protecting agriculture. Protecting agriculture is a component of the original water plan in 2003 and Santa Fe County and Rio Arriba are focused on protecting agriculture.

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2. Comment from Jon Klingel

   From: Jon Klingel [mailto:jon@klingel.name]
   Sent: Saturday, May 07, 2016 11:20 AM
   To: Kathleen S. Holian; Tina Salazar
   Cc: Joe Zupan; Rachel Conn
   Subject: Re: Jemez y Sangre Regional Water Plan Update

   Kathy,

   I believe a very critical part of reducing the gap between supply and demand during future drought is what we do with water saved by measures to reduce consumption. If the "saved" water is allowed to stay in the system, such as in the aquifer and streams then it will be available during future droughts. If the "saved" water is used to grow the size of the community (more condos, high water demand industry, etc.) then all we have done is harden the demand for future droughts. Controlling growth is critical to surviving future droughts. Also, considerable water (may be as high as 25%) is used in traditional energy production (coal, fracking, nuclear,

etc.). Moving towards renewable energy which has a low water demand such as solar and wind will reduce water demand during future drought. These factors need to be part of any intelligent water planning.

Thanks for the opportunity to comment. Jon Klingel

Response to Comment 2:

Reducing water demand is a key component of the original water plan and will continue to be supported by the Jemez y Sangre Regional Water plan. We have added a sentence to Section 8 that refers back to all original actions proposed in the 2003 water plan. We have also added a section on preparing the region for climate change including "provide incentives and programs to reduce water use". Many of the communities in the Jemez y Sangre region are leaders in water conservation. The issue of "demand hardening" is very important and the City of Santa Fe has worked to develop a portfolio that is based on conjunctive use, whereby surface water is utilized when available. The aquifers are allowed to recover during years when surface water is sufficient, making the groundwater available for periods of drought. Decision makers understand that the water in reserve should not be tapped to meet increasing demands.

Water for the power industry represented about 1.5 percent of New Mexico's water diversions in 2010, or about 58,000 ac-ft. While the Jemez y Sangre Steering Committee recognizes that our energy consumption is connected to this water use outside of the region, we added a recommendation to the State to support lower water demand energy sources.

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3. Comment from De Anda Hay

From: De Anda Hay <deandahay@aol.com>
Subject: Re: Jemez y Sangre Regional Water Plan Update
Date: May 6, 2016 at 1:41:41 PM MDT
To: kathleensholian@gmail.com

Dear Commissioner Holian,

You got my attention with the proposal to transfer water rights for agricultural uses to municipal water utilities! Of course, I think the region should be looking for ways to protect and preserve water rights for agricultural uses, though I think any agricultural use should require more than one source of water (potable should not be the only source) e.g., water harvesting, etc.

I reviewed the report. Well done! But three things come to mind:

1. Eliminating & removing water aggressive plants & prohibiting their planting and growth, e.g. Russian Elms, etc. (This alone would restore my sanity in Spring when the Elms release their seeds by the tens of thousands & many take hold.)

2. Encouraging alternatives to in ground planting, including greenhousing and the development of vertical gardens, which better use and recycle water,

3. There was a third, but I'm rushed and forgot the point. Will send if recall.

All the best, M DeAnda Hay

Response to Comment 3:
We added a recommendation to the state to help educate the public on how to identity and remove invasive plants. The Office of the State Engineer has a list of recommended plants (http://wuc.ose.state.nm.us/Plants/) that and an irrigation calculator to help homeowners plan their landscaping (http://wuc.ose.state.nm.us/irrcalc/). We added two collaborative projects with respect to protecting agriculture and promoting resilience under climate change.

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4. Comment from Elly Sherr

From: "Steve and Elly" <shalom@newmexico.com>
Subject: Re: Jemez y Sangre Regional Water Plan Update
Date: May 6, 2016 at 9:06:07 AM MDT
To: "Kathleen S. Holian" <kathleensholian@gmail.com>

Dear Ms. Holian, Thank you for this update. As you probably know, the island of Bermuda has zero water sources. Every house and building have cisterns. I believe new homes built in this area should have cisterns and older homes could also have them installed, at least for gardening. When it rains here, it really rains! Just a thought, thanks, Elly Sherr

Response:
Santa Fe County passed Ordinance No 2003-6 to require rainwater catchment systems for all commercial and residential development. Specifically, the ordinance requires buried cisterns on all new homes larger than 2,500 square feet large enough to capture water from 85% of the roof area and hold up to 1.15 gallons per square foot of heated area. Smaller homes are required to install rain barrels or other water catchment basins.

The City of Santa Fe has rebate programs for rainwater harvesting (http://www.santafenm.gov/document_center/document/254).

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5. Comment from Tom Claffey

From: Tom Claffey [mailto:tomsyl@cybermesa.com]
Sent: Thursday, May 05, 2016 6:04 PM
To: Kathleen S. Holian

Cc: Tina Salazar
Subject: Re: Jemez y Sangre Regional Water Plan Update

Good stuff, Kathy. Thank you.
Two items jumped up in my mind immediately (to decrease water usage):
(1) Severe restrictions on residential swimming pools.
(2) Severe restrictions on the planting of heavy water-sucking plants/trees such as elm and Russian olive trees.

Warm regards, Tom Claffey

Response to Comment 5:

Reducing water demand is a key component to the Jemez y Sangre original water plan in 2003. We have added language to Section 8 to highlight the need to make the region more resilient under climate change, including "provide incentives and programs to reduce water use".

Appendix 6-A

List of Individuals Interviewed

Appendix 6-A. List of Individuals Interviewed
Jemez y Sangre Water Planning Region

Name	Title	Organization	City
Liz Beth Walker	Representative	USDA NCRS	Santa Fe
Russell Naranjo	Planning Director	City of Espanola	Espanola
Lucia Sanchez	Director	Rio Arriba Co. Planning & Zoning	Espanola
Chris Madrid	Director	Rio Arriba Co. Economic Development	Espanola
Duncan Sill	Economic Director	NCNM EDD	Santa Fe
Kathy Keith	Executive Director	Rural Development Corporation	Santa Fe
Reed Liming	Planning Director	City of Santa Fe	Santa Fe
Robert Griego	Planning Director	Santa Fe County	Santa Fe
Katherine Mortimer	Sustainable Santa Fe Programs Manager	City of Santa Fe	Santa Fe
Steve Warshawer	Owner	Beneficial Farms	Glorieta area
Charlie Nylander	Chair	Espanola Basin Technical Advisory Group	Santa Fe
Conci Bokum	Member	Jemez Y Sangre Advisory Committee	Santa Fe
Scott Randall	President/CEO	Los Alamos Community Development Corporation	Los Alamos
Gary Leikness	Manager	Los Alamos County Planning Division	Los Alamos
Kurt Steinhaus	Representative	LANL Community Program Office	Los Alamos
Ginny Selvin	Controller	Las Campanas Water & Sewer Coop	Santa Fe

Appendix 6-B

Projected Population Growth Rates, 2010 to 2040

Appendix 6-B. BBER Projected Five-Year Population Growth Rates, 2010 to 2040 Jemez y Sangre Water Basins Water Planning Region

County	Five-Year Growth Rate (%)					
	2010-2015	2015-2020	2020-2025	2025-2030	2030-2035	2035-2040
Los Alamos	0.18	0.03	-0.26	-0.75	-1.55	-2.23
Rio Arriba	1.01	0.60	0.08	-0.45	-0.89	-1.24
Santa Fe [a]	2.02	2.15	4.88	3.78	NA	NA

Source: New Mexico County Population Projections, July 1, 2010 to July 1, 2040. Geospatial and Population Studies Group, Bureau of Business & Economic Research, University of New Mexico. Released November 2012, unless otherwise noted.

[a] Source released July 2014 (excludes Estancia/Edgewood region).

NA = Population growth estimated for entire counties only.

Appendix 8-A

Recommended Projects, Programs, and Policies

Regional Water Planning Update

Projects, Programs, and Policies

Water Planning Region 3: Jemez y Sangre

JyS ID	County	Regional or System Specific	Strategy Type	Strategy Approach	Subcategory	Project Name	Source of Project Information	Description	Project Lead	Partners	Fiscal Year	Phase	Cost	Need or Reason for the Project, Program, or Policy
1	LA	R	PJ	Increase Water Supply	Drill New Well	New Pajarito Well 6	PEGO 2016	Water Production	Los Alamos County Utility		FY17	Construction	$ 3,000,000.00	
2	LA	R	PJ	Increase Water Supply	Water System	Guaje Pines-N. Mesa-Diamond Connector/Camp May Tk Freeze Prot.	PEGO 2016	Water Production	Los Alamos County Utility		FY18	Design/Const.	$ 1,075,000.00	
3	LA	R	PJ	Increase Water Supply	Source of Supply	SJC Well Site 3 Test/ Permit/NPW Storage & Other	PEGO 2016	Water Production	Los Alamos County Utility		FY21	Construction	$ 4,100,000.00	
4	LA	R	PJ	Increase Water Supply	Source of Supply	Otowi 1 BS Replacement								
5	LA	R	PJ	Increase Water Supply	Source of Supply	SJC Well 2 Permit/San Juan 3/Other	PEGO 2016	Water Production	Los Alamos County Utility		FY23	Construction	$ 6,550,000.00	
6	LA	R	PJ	Increase Water Supply	Source of Supply	Otowi Well 2 New Tank, SJC Well 2 Des./SJC Well 3 Const.	PEGO 2016	Water Production	Los Alamos County Utility		FY23	Design & Construction	$ 7,700,000.00	
7	LA	R	PJ	Increase Water Supply	Source of Supply	SJC 2 Const./NP Bayo Storage/Other	PEGO 2016	Water Production	Los Alamos County Utility		FY24	Construction	$ 8,100,000.00	
8	LA	SS	PJ	Improve System Efficiency	Water System Infrastructure (M)	North Mesa Distribution Upgrades	PEGO 2016	Water Distribution	Los Alamos County Utility		FY24		$ 800,000.00	
9	LA	SS	PJ	Improve System Efficiency	Source of Supply	Pajarito Well 6	PEGO 2016	Water Production	Los Alamos County Utility		FY17	Design/EA	$ 2,304,400.00	
10	LA	SS	PJ	Improve Water Supply	Water System Infrastructure	Ski Basin Pot. Water Supply Pajarito 6 Well/Other	PEGO 2016	Water Production	Los Alamos County Utility		FY17	Construction	$ 7,644,000.00	
11	LA	SS	PJ	Improve System Efficiency	Wastewater	Joya/Mimbres/Kayenta Sewer Mains	PEGO 2016	Collection	Los Alamos County Utility		FY17	Construction	$ 425,000.00	
12	LA	SS	PJ	Improve System Efficiency	Wastewater	White Rock WRRF	PEGO 2016	Water Resources Recovery	Los Alamos County Utility		FY17/18	PER/Design	$ 1,050,000.00	
13	LA	SS	PJ	Improve System Efficiency	Water System Infrastructure (M)	PRV Replacement, Aspen School Area Dist. Phase 3	PEGO 2016	Water Distribution	Los Alamos County Utility		FY19	Phase I	$ 825,000.00	
14	LA	SS	PJ	Improve System Efficiency	Water System Infrastructure (M)	Western Area/ Quemazon Water Line/Barranca Mesa Tank Rehab	PEGO 2016	Water Distribution	Los Alamos County Utility		FY18	Design & Construction	$ 1,025,000.00	
15	LA	SS	PJ	Improve System Efficiency	Water System Infrastructure (M)	New Bayo NPW Tank and Booster Station/SJC 3 Pump Test/Other	PEGO 2016	Water Production	Los Alamos County Utility		FY21	Construction	$ 7,644,000.00	
16	LA	SS	PJ	Improve F20:P20System Efficiency	Wastewater	Kayenta Inv. Siphon Replacement	PEGO 2016	Wastewater Collection	Los Alamos County Utility		FY18	Construction	$ 500,000.00	
17	LA	SS	PJ	Improve System Efficiency	Wastewater	White Rock WRRF	PEGO 2016	Water Resources Recovery	Los Alamos County Utility		FY18/19	Design & Construction	$ 10,000,000.00	
18	LA	SS	PJ	Improve System Efficiency	Water System Infrastructure (M)	PRV Replacement, Aspen School Dist. WL Replcmt. Ph. 1	PEGO 2016	Water Distribution	Los Alamos County Utility		FY19	Design & Construction	$ 825,000.00	
19	LA	SS	PJ	Improve System Efficiency	Wastewater	Canyon Road Sewer Crossg./Maint. Equipment/Other	PEGO 2016	Wastewater Collection	Los Alamos County Utility		FY19	Construction	$ 530,000.00	
20	LA	SS	PJ	Improve System Efficiency	Wastewater Treatment	WRRF UV Control Imp./Compost Storage Bins	Chavez, 2015	Water Resources Recovery	Los Alamos County Utility		FY19		$ 250,000.00	
21	LA	SS	PJ	Improve System Efficiency	Water System Infrastructure (M)	PRV Replacement, Aspen School Area Dist. Phase 3	PEGO 2016	Water Distribution	Los Alamos County Utility		FY19	Design & Construction	$ 825,000.00	
22	LA	SS	PJ	Improve System Efficiency	Wastewater	Aspen School Area, Western Area.N. Community	PEGO 2016	Wastewater Collection	Los Alamos County Utility		FY20	Construction	$ 1,100,000.00	
23	LA	SS	PJ	Improve System Efficiency	Wastewater Treatment	LA WRRF Effluent Filtration System	PEGO 2016	Water Resources Recovery	Los Alamos County Utility		FY20	Design	$ 140,000.00	
24	LA	SS	PJ	Improve System Efficiency	Water System Infrastructure (M)	PRV Replacement/Aspen School Area WL Rplcmt. Ph. 2	PEGO 2016	Water Distribution	Los Alamos County Utility		FY20	Construction	$ 975,000.00	

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Water Planning Region 3: Jemez y Sangre

JyS ID	County	Regional or System Specific	Strategy Type	Strategy Approach	Subcategory	Project Name	Source of Project Information	Description	Project Lead	Partners	Fiscal Year	Phase	Cost	Need or Reason for the Project, Program, or Policy
25	LA	SS	PJ	Improve System Efficiency	Water Distribution	Aspen School Area Phase 3	PEGO 2016	Water Distribution	Los Alamos County Utility		FY21	Design & Construction	$ 750,000.00	
26	LA	SS	PJ	Improve System Efficiency	Wastewater	Lift Station/Aspen School Area Ph.3	PEGO 2016	Wastewater Collection	Los Alamos County Utility		FY21	Construction	$ 750,000.00	
27	LA	SS	PJ	Improve System Efficiency	Wastewater Treatment	LA WRRF Eff. Filtration System	PEGO 2016	Wastewater Treatment	Los Alamos County Utility		FY21	Construction	$ 1,400,000.00	
28	LA	SS	PJ	Improve System Efficiency	Water System Infrastructure (M)	PRV Replacement/Barranca Mesa Tank Repaint	PEGO 2016	Water Distribution	Los Alamos County Utility		FY22	Construction	$ 600,000.00	
29	LA	SS	PJ	Improve System Efficiency	Water System Infrastructure	PRV Replacement/Western Area (47th Street) Water Line Replacement	PEGO 2016	Water Distribution	Los Alamos County Utility		FY23	Design & Construction	$ 500,000.00	
30	LA	SS	PJ	Improve System Efficiency	Wastewater	Lift Station Replacement (2)/Western Area/North Community/Other	PEGO 2016	Sewer Collection	Los Alamos County Utility		FY23	Construction	$ 860,000.00	
31	LA	SS	PJ	Improve System Efficiency	Water	North Mesa Distribution Improvements	PEGO 2016	Water Distribution	Los Alamos County Utility		FY24	Construction	$ 800,000.00	
32	LA	SS	PJ	Improve System Efficiency	Water System Infrastructure (M)	Non-potable Wash Water for LA WRRF	PEGO 2016	Water Resources Recovery	Los Alamos County Utility		FY24		$ 500,000.00	
33	LA	SS	PJ	Improve System Efficiency	Wastewater	Wastewater Line Replacement, Western Area 3/SCADA Improvement	PEGO 2016	Wastewater	Los Alamos County Utility		FY24		$ 450,000.00	
34	LA	SS	PJ	Improve System Efficiency	Water	Denver Area Line Replacement	PEGO 2016	Water Distribution	Los Alamos County Utility		FY25	Design & Construction	$ 900,000.00	
35	LA	R	PJ	Improve System Efficiency	Water	SJC Well Site 1(Test, Permit & Const)/Otowi Well 2 (Const)/ Upper Townsite NPWL Conn	PEGO 2016	Water Production	Los Alamos County Utility		FY25	Design & Construction	$ 10,700,000.00	
36	LA	SS	PJ	Improve System Efficiency	Wastewater	Lift Station Replacement/Arkansas Area Line Replacement	PEGO 2016	Wastewater	Los Alamos County Utility		FY25	Design & Construction	$ 700,000.00	
37	LA	SS	PJ	Improve System Efficiency	Wastewater	LA WRRF Gen Set Upgrade	PEGO 2016	Wastewater	Los Alamos County Utility		FY25	Design & Construction	$ 400,000.00	
38	RA	R	PJ	Improve System Efficiency	Water System Infrastructure	San Juan - Chama canal lining	Erdmann, 2015	Cost share with BoR to line the unlined portion of SJCP canals and acquire the saved water otherwise lost to seepage (about 5,000 AFY to City)	City of Santa Fe	Bureau of Reclamation	FY20	Development		Reduce Carriage Losses and improve efficiency in order to make more wet water available.
39	RA	R	PJ	Improve System Efficiency	Regional Water System	Expand Regional Water Supply	ICIP, 2014	Expand Regional Water Supply	Greater Chimayo MDWCA		FY17-19		$10,900,000	
40	RA	R	PJ	Protect Existing Supplies	Flood Control	earthen channel embankments to mitigate flood control	WTB 2015		Santa Clara Pueblo		FY16		$2,000,000	
41	RA	SS	PJ	Improve System Efficiency	Water System Infrastructure (M)	Pump house and Disinfection System	ICIP, 2014	Pump house and Disinfection System	Alcalde MDWCA		FY16		$90,000	
42	RA	SS	PJ	Improve System Efficiency	Water System Infrastructure (M)	North Service Area Expansion I	ICIP, 2014	North Service Area Expansion I	Alcalde MDWCA		FY17		399,036	
43	RA	SS	PJ	Improve System Efficiency	Water System Infrastructure (M)	South Service Area Expansion II	ICIP, 2014	South Service Area Expansion II	Alcalde MDWCA		FY18		$399,036	
44	RA	SS	PJ	Improve System Efficiency	Water System Infrastructure (M)	East Service Area Expansion III	ICIP, 2014	East Service Area Expansion III	Alcalde MDWCA		FY19		$399,036	
45	RA	SS	PJ	Improve System Efficiency	Water System Infrastructure (M)	West Service Area Expansion IV	ICIP, 2014	West Service Area Expansion IV	Alcalde MDWCA		FY20		$399,036	
46	RA	SS	PJ	Increase Water Supply	Drill new Wells	Supplemental water supply well	Lucero, 2015		Alcalde MDWCA		FY20			

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Water Planning Region 3: Jemez y Sangre

JyS ID	County	Regional or System Specific	Strategy Type	Strategy Approach	Subcategory	Project Name	Source of Project Information	Description	Project Lead	Partners	Fiscal Year	Phase	Cost	Need or Reason for the Project, Program, or Policy
47	RA	SS	PJ	Improve System Efficiency	Water Treatment	Arsenic Treatment Building	ICIP, 2014, Lucero, 2015	Arsenic Treatment Building	Agua Sana MDWCA		FY16		330,679	
48	RA	SS	PJ	Improve System Efficiency	Water Treatment	Treatment Facility	ICIP, 2014	Treatment Facility	Agua Sana MDWCA		FY17		289,385	
49	RA	SS	PJ	Improve System Efficiency	Water System Infrastructure (M)	Backwash Facility	ICIP, 2014	Backwash Facility	Agua Sana MDWCA		FY18		209,435	
50	RA	SS	PJ	Improve System Efficiency	Water System Infrastructure (M)	SCADA	ICIP, 2014	SCADA	Agua Sana MDWCA		FY20		44,916	
51	RA	SS	PJ	Improve System Efficiency	Water Treatment	Uranium Treatment	ICIP, 2014	Uranium Treatment	Chamita MDWCA		FY16		750,000	
52	RA	SS	PJ	Improve System Efficiency	Water System Infrastructure (M)	Well Rehabilitation	ICIP, 2014	Well Rehabilitation	Chamita MDWCA		FY16		20,000	
53	RA	SS	PJ	Improve System Efficiency	Water System Infrastructure (M)	Water Storage Tank	ICIP, 2014	Water Storage Tank	Chamita MDWCA		FY16		$100,000	
54	RA	SS	PJ	Improve System Efficiency	M	Feasibility Study	ICIP, 2014	Feasibility Study	Chamita MDWCA		FY17		$50,000	
55	RA	SS	PJ	Protect Existing Supplies	Flood Control	Flood Control Plan	ICIP, 2014	Flood Control Plan	Chamita MDWCA		FY18		$5,000	
56	RA	SS	PJ	Increase Water Supply	Transfer Water Rights	Water Transfer	ICIP, 2014	Water Transfer	Chamita MDWCA		FY19		$15,000	
57	RA	SS	PJ	Protect Existing Supplies	Wastewater infrastructure	Sewage System	ICIP, 2014	Sewage System	Chamita MDWCA		FY20		$20,000,000	
58	RA	SS	PJ	Improve System Efficiency	Water System Infrastructure (M)	Water System Improvement Project	ICIP, 2014	Water System Improvement Project	Cordova MDWCA		FY16		$1,736,000	
59	RA	SS	PJ	Improve System Efficiency	Water System Infrastructure (M)	SCADA and 50K Gallon Storage Tank	ICIP, 2014	SCADA and 50K Gallon Storage Tank	Cordova MDWCA		FY17		$300,000	
60	RA	SS	PJ	Improve System Efficiency	Water System Infrastructure (M)	Waterline and 65K Gallon Water Storage Tank	ICIP, 2014	Waterline and 65K Gallon Water Storage Tank	Cordova MDWCA		FY18		$935,000	
61	RA	SS	PJ	Improve System Efficiency	Water System Infrastructure (M)	Water Distribution	ICIP, 2014	Water Distribution	Cordova MDWCA		FY19		$1,335,000	
62	RA	SS	PJ	Increase Water Supply	Drill new Wells	Water Supply Well	ICIP, 2014	Water Supply Well	Cordova MDWCA		FY20		$355,000	
63	RA	SS	PJ	Increase Water Supply	Transfer Water Rights	Purchase Water Rights, Land	ICIP, 2014	Purchase Water Rights, Land	Greater Chimayo MDWCA		FY16		$500,000	
64	RA	SS	PJ	Increase Water Supply	Water System Infrastructure (M)	Chimayo Well No. 4	ICIP, 2014	Chimayo Well No. 4	Greater Chimayo MDWCA		FY16		$560,000	
65	RA	SS	PJ	Improve System Efficiency	Water System Infrastructure (M)	GCMDWCA Phase II-Distrib System	ICIP, 2014	GCMDWCA Phase II-Distrib System	Greater Chimayo MDWCA		FY17		$4,000,000	
66	RA	SS	PJ	Improve System Efficiency	Water System Infrastructure (M)	El Llano Water Tank, Chimayo	ICIP, 2014	El Llano Water Tank, Chimayo	Greater Chimayo MDWCA		FY16		$500,000	
67	RA	SS	PJ	Improve System Efficiency	Water System Infrastructure (M)	water system improvements	WTB 2015		Santa Clara Pueblo		FY16		$3,500,000	

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Projects, Programs, and Policies

Water Planning Region 3: Jemez y Sangre

JyS ID	County	Regional or System Specific	Strategy Type	Strategy Approach	Subcategory	Project Name	Source of Project Information	Description	Project Lead	Partners	Fiscal Year	Phase	Cost	Need or Reason for the Project, Program, or Policy
68	RA LA SF	R	PM	Protect Existing Supplies	Watershed Restoration	Rio Grande Water Fund	Lyons, 2015	The Rio Grande Water Fund is a program that will invest in wildfire mitigation treatments and stream restoration in forested headwaters of the Rio Grande in order to protect critical downstream water supplies and improve resilience under climate change. The program goals are to generate sustainable funding over the next 20 years to proactively increase the pace and scale of forest restoration, prioritizing the most high-risk areas in the Rio Grande watershed. Leveraging current state and federal Hazardous Fuels Reduction expenditures, the program will generate approximately $15 million to treat up to 30,000 acres per year - a ten-fold increase over the current pace of forest treatment in the program area. Strategic landscape-scale investments will also spur local economic growth, create jobs, and revitalize New Mexico's forest industry.	The Nature Conservancy	NM Land Grant Council, NM Land Grant Consejo, Chama Peak Land Alliance, Forest Guild, NM Environment Department, Ciudad Soil and Water Conservation District, NM Water Business Task Force, AMAFCA, Bernalillo Co, NM Acequia Association, Trout Unlimited, US F&W Service, Valles Caldera NP, NM Forest Industry Association, BLM, Sierra Club, Bosque Environmental Management Program, The Nature Conservancy in NM, NRCS, Rocky Mountain Youth Corps, Albuquerque Bernalillo County	FY16	?	$15,000,000/yr	Native Rio Grande water provides 25% of municipal supply and over 95% of agricultural supply in the Rio Grande Valley. San-Juan Chama Project water now provides over 50% of municipal supply. Recent wildfires in the Rio Grande Watershed have impaired Rio Grande water quality and damaged critical water supply infrastructure, resulting in significant water supply disruptions for communities in Santa Fe and Albuquerque. As temperatures increase with climate change and regional drought continues, landscape-scale forest treatments in are needed to mitigate the risk that wildfire poses to downstream water supplies and critical water infrastructure.
69	SF	R	PJ	Improve System Efficiency	Regional Water System	Regional Water System	ICIP, 2014		Cuatro Villas MDWCA		FY16-20		$33,924,305	
70	SF	R	PJ	Improve System Efficiency	Regional Wastewater System	Regional Wastewater System	ICIP, 2014		Cuatro Villas MDWCA		FY16-20		$10,000,000	
71	SF	R	PJ	Protect Existing Supplies	Flood Control	Santa Cruz Flood-Control Dam Site 1 Rehab	ICIP, 2014	Santa Cruz Flood-Control Dam Site 1 Rehab	Santa Fe-Pojoaque Soil & Water Cons Dist		FY16-18		3,150,000	Storm/Surface Water Control
72	SF	R	PJ	Protect Existing Supplies	Flood Control	Santa Cruz Valley Flood-Control Dam Barriers	ICIP, 2014	Santa Cruz Valley Flood-Control Dam Barriers	Santa Fe-Pojoaque Soil & Water Cons Dist		FY16-18		225,000	Storm/Surface Water Control
73	SF	R	PJ	Improve System Efficiency	Water System Infrastructure (M)	upgrade County transmission lines	WTB 2015		Canoncito at Apache Canyon MDWC&MSW		FY16		$2,380,000	
74	SF	R	PJ	Protect Existing Supplies	Dam Repair	dam restoration	WTB 2015		Santa Cruz Irrigation District		FY16		$1,853,000	

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JyS ID	County	Regional or System Specific	Strategy Type	Strategy Approach	Subcategory	Project Name	Source of Project Information	Description	Project Lead	Partners	Fiscal Year	Phase	Cost	Need or Reason for the Project, Program, or Policy
75	SF	R	PJ	Improve System Efficiency	Water System Infrastructure (M)	Regional Programs to Assist Rural and Private Water and Wastewater Systems	SFCO Utilities, June 2015	Examples: Chupadero, Canoncito, Hyde Park Estates, Las Lagunitas, etc.	Santa Fe County	Chupadero, Canoncito, Hyde Park, Las Lagunitas	FY14-??	Current		provide wholesale or retail water or wastewater service to systems; improve system infrastructure; provide technical assistance (e.g. hydrogeology expertise, operator assistance, fiscal agent services, etc.)
76	SF	R	PJ	Improve System Efficiency	Regional Water System	Water System Regionalization	SFCO Utilities, June 2015	For economy of scale, long term sustainability, and cost savings, and as appropriate, combine water systems	Santa Fe County	CiSF coordination	FY20			
77	SF	R	PJ	Increase Water Supply	Wastewater Reuse	Direct and Indirect Effluent Reuse	SFCO Utilities, June 2015	Step 1: Complete reclaimed WW FS	City of Santa Fe	Santa Fe County	FY17-FY25			To preserve and augment existing water sources
78	SF	R	PJ	Protect Existing Supplies	Watershed Restoration	Regional Watershed restoration	SFCO Utilities, June 2015	E.g. Rio Grande River Fund, Lower Santa Fe River, Pojoaque River	Santa Fe County	Pojoaque Pueblo?	FY17			
79	SF	R	PJ/PY	Increase Existing Supplies	Regional Water System	Pojoaque Basin Regional Water System	SFCO Utilities, June 2015	Current activities: Joint Powers Agreement, Operating Agreement, Water Admin Rules and Regs, Reclamation Funding Agreements, federal and state funding allocations	Santa Fe County	Pueblos of Tesuque, Nambe, Pojoaque and San Ildefonso	FY16-FY24	Current	$210M	To settle the Aamodt adjudication and Pueblo water right claims
80	SF	R	PM	Increase Water Supply	Water Rights	Return Flow Credit Application	Erdmann, 2015	Apply for Return Flow Credits for water leaving the City of Santa Fe's Waste Water Treatment Plant	City of Santa Fe		FY17	Development	n/a	The City of Santa Fe returns nearly 5000 AFY to the Santa Fe River downstream of the City Limits and does not receive return flow credits. RFC's would protect downstream irrigators and could enable the City to divert additional surface water, increasing the extent to which the city is able to rely on renewable water resources.
81	SF	R	PM	Protect Existing Supplies	Planning	Augmented Recharge from Storm Water Management	Erdmann, 2015	Improve storm water system to slow down flows and allow infiltration into aquifer.	City of Santa Fe		FY17	Development	unknown	

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JyS ID	County	Regional or System Specific	Strategy Type	Strategy Approach	Subcategory	Project Name	Source of Project Information	Description	Project Lead	Partners	Fiscal Year	Phase	Cost	Need or Reason for the Project, Program, or Policy
82	SF	R	PM	Increase Water Supply	Planning/Study	Reclaimed Water FS	Erdmann, 2015	Evaluation of alternatives for the reuse of reclaimed wastewater as a way to enhance the city's water system resiliency and overall supply.	City of Santa Fe		FY16	Development		The Climate Change updates to the LRWSP identified reclaimed wastewater as one of the best alternatives for a new source of supply for the city of Santa Fe. The Feasibility Study is designed to evaluate options about how to optimize the reuse of this water. This project relies on triple bottom line accounting - economic, cultural, and environmental considerations will be inputs to the program.
83	SF	R	PM	Protect Existing Supplies	Groundwater Modeling	Espanola Basin GW model	SFCO Utilities, June 2015	Jointly create a groundwater mode for the JyS basin	Santa Fe County/City of Santa Fe?		FY17			To better understand the GW/SW system in order to better plan and use as a water supply
84	SF	R	PM	Protect Existing Supplies	Monitoring	Regional Water Supply Monitoring Network	SFCO Utilities, June 2015	Establish and support regional surface and groundwater quantity and quality monitoring program; support EBTAG	Santa Fe County			Current		
85	SF	R	PY	Protect Existing Supplies	Conservation	Domestic Well Licensing	Erdmann, 2015	City Ordinance restricts the drilling of domestic wells within city limits to properties that are greater than 300' from an existing water line OR for which the cost of connecting to city water > the cost of installing a domestic well. For wells that are drilled, the city restricts the amount of water that can be withdrawn AND requires annual reporting of monthly usage.	City of Santa Fe		FY09	Ongoing	n/a	Domestic Wells tap into the same groundwater resource which the City relies on to support the City Well Field. The City restricts the drilling of domestic wells within City limits in order to protect this resource and to encourage the efficient use of water by residents.
86	SF	R	PY	Reduce Demand	Conservation	Regional Conservation Program	SFCO Utilities, June 2015	To further improve water use efficiency within the region	Santa Fe County	TBD		Current		
87	SF	R	PY	Mitigate Drought, Reduce Demand, Protect existing Supplies	Conservation	Regional universal water-related policies, programs agreements, etc.	SFCO Utilities, June 2015	To address water conservation, shortage sharing, water use limitations, tiered rates, domestic well management, leak detection	Santa Fe County			Current		
88	SF	SS	PJ	Improve System Efficiency	Water System Infrastructure	McClure Reservoir Upgrades	Erdmann, 2015	Recomplete the McClure reservoir including replacement of all components related to releasing water. Optimize reservoir management (sediment removal, evaporative loss reduction)	City of Santa Fe		FY16	Construction Phase II	$ 3,000,000.00	Upgrades were required in order to better manage the water resources in the Upper Santa Fe River watershed for flood control and municipal water supply.

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JyS ID	County	Regional or System Specific	Strategy Type	Strategy Approach	Subcategory	Project Name	Source of Project Information	Description	Project Lead	Partners	Fiscal Year	Phase	Cost	Need or Reason for the Project, Program, or Policy
89	SF	SS	PJ	Improve System Efficiency	Water System Infrastructure	Canada Replacement Well	Erdmann, 2015	Drill a replacement well for the Canada well, a 50 year old well within the City of Santa Fe Well Field	City of Santa Fe		FY16	Development	$ 1,000,000.00	The City Well Field, located within the City limits of Santa Fe, is comprised of wells that are approaching 50 years old. Replacement wells will enable the City to preserve this source of supply as a backup groundwater reserve to augment the city's surface water rights.
90	SF	SS	PJ	Improve System Efficiency	Water System Infrastructure	Parallel Pipeline to Buckman	Erdmann, 2015	Install a 24" pipeline in parallel to the existing 20" pipeline bringing water from the Buckman area into the City of Santa Fe area	City of Santa Fe		FY16	Initial Planning		The present system has a choke point which limits the ability of the city to meet peak demand times via water from the Buckman area (Buckman Well Field and Buckman Direct Diversion area). This project would remove the choke point.
91	SF	SS	PJ	Improve System Efficiency	Water System Infrastructure	Fergusson Replacement Well	Erdmann, 2015	Drill a replacement well for the Fergusson well, a 50 year old well within the City of Santa Fe Well Field	City of Santa Fe		FY16	Initial Planning	$ 1,000,000.00	The City Well Field, located within the City limits of Santa Fe, consists of wells that are approaching 50 years old. Replacement wells will enable the City to preserve this source of supply as a backup groundwater reserve to augment the city's surface water rights.
92	SF	SS	PJ	Improve System Efficiency	Planning/Study	Improved Espanola Basin Groundwater Model - La Cinema area in particular	Erdmann, 2015	Higher resolution and updated groundwater modelling (to reflect ongoing studies of regional geography) are required to better account for ongoing issues in the Espanola basin	City of Santa Fe	Santa Fe County, Office of the State Engineer, Los Alamos County, Eldorado, La Cienega	FY18	Development	$ 250,000.00	
93	SF	SS	PJ	Reduce Demand		Meter Calibration Program	Erdmann, 2015	Meter Calibration Program	City of Santa Fe					
94	SF	SS	PJ	Reduce Demand		Priority Line Replacement CIP	Erdmann, 2015	Priority Line Replacement CIP	City of Santa Fe					
95	SF	SS	PJ	Improve System Efficiency	Water System Infrastructure	BDD Storage Tank	Erdmann, 2015	Construct an additional storage tank for treated BDD water.	City of Santa Fe		FY17	Planning		
96	SF	SS	PJ	Improve System Efficiency	Water System Infrastructure	Rebuild the 4mg Hospital Tank	Erdmann, 2015	Construct a New 4 mg storage tank to replace the Hospital Tank	City of Santa Fe		FY17	Design		The 4 million gallon hospital Tank is strategically located within the City in terms of utilizing wells and optimizing system pressure. The existing tank has some design issues and has not been used in a few years. The new tank will improve system efficiency and increase system storage.

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Water Planning Region 3: Jemez y Sangre

JyS ID	County	Regional or System Specific	Strategy Type	Strategy Approach	Subcategory	Project Name	Source of Project Information	Description	Project Lead	Partners	Fiscal Year	Phase	Cost	Need or Reason for the Project, Program, or Policy
97	SF	SS	PJ	Improve System Efficiency	Water System Infrastructure	Meter Replacement	Erdmann, 201; WTB, 2015	Replace domestic and commercial meters with new models designed to allow real time tracking and to improve meter accuracy.	City of Santa Fe		FY16	Preliminary Engineering	$ 2,000,000.00	The City's domestic and residential meters are aging, which reduces accuracy, and new technology is now available which enables real time tracking to better identify spikes in usage which may be due to leakage on the customer side of the meter. Early detection of these leaks will improve the efficiency of these repair and save water in the system.
98	SF	SS	PJ	Protect Existing Supplies	Watershed Restoration	Santa Fe Municipal Watershed Management Plan: Forest Thinning	Erdmann, 2015	Mechanical Thinning and Prescribed Burning in the Upper Santa Fe River Watershed to restore forest health and to reduce the risk of catastrophic wildfire	City of Santa Fe	USFS	FY15-19	Ongoing	$ 480,000.00	Forest thinning is ongoing in the Santa Fe River Watershed in order to reduce the risk from extreme wildfire and to improve forest health in terms of remaining consistent with natural levels of forest canopy.
99	SF	SS	PJ	Protect Existing Supplies	Watershed Education	Santa Fe Municipal Watershed Management Plan: Outreach & Education	Erdmann, 2015	Outreach & Education	City of Santa Fe	USFS	FY15	Ongoing	$ 150,000.00	My Water, My Watershed Program for Middle School & High School Water Quality Monitoring Programs. Adult & Family educational Watershed hikes provide limited access to the closed watershed. Publications and videos addressing the Santa Fe Municipal Watershed Management program and informing water utility customers of their payment for ecosystem services. Direct funding of the Climate Masters program.

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Water Planning Region 3: Jemez y Sangre

JyS ID	County	Regional or System Specific	Strategy Type	Strategy Approach	Subcategory	Project Name	Source of Project Information	Description	Project Lead	Partners	Fiscal Year	Phase	Cost	Need or Reason for the Project, Program, or Policy
100	SF	SS	PJ	Improve System Efficiency	M	ADD NEW WATER PRODUCTION WELL-	Chakroff, 2015	This project would construct a new production well for the EAWSD water system.	Eldorado Area Water & Sanitation District		FY 14-16	Preliminary Engineering and well siting complete, water rights application in process, then construction if no protest	1,596,000.00	EAWSD cannot currently meet NMED recommended standards to meet or exceed Maximum Daily Demand and Average Daily Demand with its largest well out of service, under sustainable production goals for generally accepted industry practices. A new well, with acceptable production, would allow regular periods of rest and recovery, based on EAWSD to meet the NMED standards for a 20-year planning period.
101	SF	SS	PJ	Improve System Efficiency	M	MAINTENANCE AND STORAGE FACILITY	Chakroff, 2015	This project would provide for site preparation and construction of a permanent field operations facility for maintenance of equipment and water system components and for storage of equipment, vehicles and materials.	Eldorado Area Water & Sanitation District		FY16	Construction bid documents ready	$1,245,300	
102	SF	SS	PJ	Improve System Efficiency	M	OPERATIONS AND ADMINISTRATION FACILITY	Chakroff, 2015	Project would provide for construction of adequate, permanent accommodations to house utility operations, administration, customer service, and billing functions of the utility, including field operations staff	Eldorado Area Water & Sanitation District		FY16	Ready for construction bid	$1,667,382	
103	SF	SS	PJ	Improve System Efficiency		PRESSURE ZONE OPTIMIZATION	Chakroff, 2015	Ongoing project designed to reduce system pressures, water loss and use.	Eldorado Area Water & Sanitation District		FY 15-16	Preliminary Engineering Report Complete, Phase I underway	$1,153,400	Many of the existing main lines experience pressures > 100 psi, which causes waterline leaks and breaks, reduces the service life of waterlines and other system components. High pressures also lead to increased water loss and customer use, since higher system pressures result in higher velocities and flows within pipes. Reducing pressures will increase the service life of existing system assets and reduce demand on water production wells due to reduced system water loss and customer use.

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JyS ID	County	Regional or System Specific	Strategy Type	Strategy Approach	Subcategory	Project Name	Source of Project Information	Description	Project Lead	Partners	Fiscal Year	Phase	Cost	Need or Reason for the Project, Program, or Policy
104	SF	SS	PJ	Improve System Efficiency	M	REGIONAL WATER SUPPLY INTERCONNECTION-	Chakroff, 2015	Project to design and construct an interconnection between the EAWSD water system and the proposed Santa Fe County regional water supply pipeline planned for construction along the northern boundary of the District.	Eldorado Area Water & Sanitation District	Santa Fe County	FY18	Preliminary Engineering Report Complete	500,000	Project would allow County water to be utilized as a supplemental supply, particularly during peak demand periods for EAWSD. It would provide a conjunctive water supply to EAWSD's ground water supply, increasing reliability and well field management options, including longer periods of rest and recovery for selected wells.
105	SF	SS	PJ	Improve System Efficiency	M	SCADA ADDITIONS-	Chakroff, 2015	Project would plan, design and install additional components needed for the Supervisory Control and Data Acquisition (SCADA) system throughout the EAWSD water system for security and to increase monitoring. and operational capabilities of the water system.	Eldorado Area Water & Sanitation District		FY16	Planning complete	$750,000	Project would add SCADA components and remote monitoring capability to 21 pressure reducing stations, providing operators immediate notice of a failure of equipment or a major line break, provide additional site security, and provide increased operational monitoring and metering capability at wells, tanks, pumping stations and other facilities.
106	SF	SS	PJ	Improve System Efficiency	M	WATER TRANSMISSION IMPROVEMENTS PROJECT	Chakroff, 2015	Project would plan, design and construct approximately 20,600 linear feet of eight-inch water line and a new booster station to pump water from Tank 4 to the to other pressure zones through Tanks 1/1A.	Eldorado Area Water & Sanitation District		FY19	Preliminary Engineering complete	$2,850,000	The project addresses deficiencies in future water storage needs, lack of dedicated transmission lines, lack of infrastructure for future growth, elevated pressures in distribution lines, and inability to transfer water from Pressure Zone 4 to other pressure zones.

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JyS ID	County	Regional or System Specific	Strategy Type	Strategy Approach	Subcategory	Project Name	Source of Project Information	Description	Project Lead	Partners	Fiscal Year	Phase	Cost	Need or Reason for the Project, Program, or Policy
107	SF	SS	PJ	Improve System Efficiency	M	WELL 2A/2B DUAL PROUDCTION-	Chakroff, 2015	Use well that was "replaced"	Eldorado Area Water & Sanitation District		FY17	Need OSE Permit	$250,000	EAWSD redrilled and replaced Well No. 2A with a new Well No. 2B. Well 2A was replaced due to declining production levels and sand production from the well. Flow tests show that both wells could be pumped simultaneously at 60 gpm, maintaining sustainable water levels. Tying Well 2A into the system would provide backup water capacity of about 1.3 million gal/mo during high-demand months of May through September, increasing system pumping capacity by about 8% for those months.
108	SF	SS	PJ	Improve System Efficiency	Water System Infrastructure (M)	Water Distribution System	ICIP, 2014	Water Distribution System	La Cienega MDW Consumers and MS Works		FY17		517,350	
109	SF	SS	PJ	Improve System Efficiency	Water System Infrastructure (M)	Service Connection	ICIP, 2014	Service Connection	La Cienega MDW Consumers and MS Works		FY18		27,350	
110	SF	SS	PJ	Improve System Efficiency	Water System Infrastructure (M)	Waterline Replacement	ICIP, 2014	Waterline Replacement	La Cienega MDW Consumers and MS Works		FY19		125,000	
111	SF	SS	PJ	Improve System Efficiency	Water System Infrastructure (A)	Alto Ditch Improvements	ICIP, 2014	Alto Ditch Improvements	Rio en Medio Ditch Assn.		FY16		13,000	
112	SF	SS	PJ	Improve System Efficiency	Water System Infrastructure (A)	Canadita Ditch Improvements	ICIP, 2014	Canadita Ditch Improvements	Rio en Medio Ditch Assn.		FY16		5,500	
113	SF	SS	PJ	Improve System Efficiency	Water System Infrastructure (A)	Medio Ditch Improvements	ICIP, 2014	Medio Ditch Improvements	Rio en Medio Ditch Assn.		FY16		6,500	
114	SF	SS	PJ	Protect Existing Supplies	Water Treatment	Regional Water System-Arsenic Treatment	WTB 2015		Cuatro Villas MDWUA		FY16		$1,500,000	
115	SF	SS	PJ	Increase Water Supply	Water System Infrastructure (M)	reuse effluent system improvements	WTB 2015		Tesuque Pueblo		FY16		$1,875,447	
116	SF	SS	PJ	Improve System Efficiency	Water System Infrastructure (M)	Phase II improvements	WTB 2015		Chupadero Water & Sewer Corp		FY16		$385,000	
117	SF	SS	PJ	Improve System Efficiency	Water System Infrastructure (M)	Phase IV water system	WTB 2015		Cuatro Villas MDWUA		FY16		$2,000,000	
118	SF	SS	PJ	Improve System Efficiency/Increase Supply	Water System Infrastructure (M)/ Drill New Wells	Phase III Water Supply Infrastructure Improvements	WTB 2015, Lucero, 2015	Upgrade existing distribution system, add fire hydrants and supplemental water well	Greater Glorieta Community Region MDW		FY16		$1,538,348	
119	SF	SS	PJ	Protect Existing Supplies	Water System Infrastructure (M)	remediate water system	WTB 2015		Pojoaque Valley School District		FY16		$400,000	
120	SF	SS	PJ	Improve System Efficiency	Water System Infrastructure (M)	Buckman Regional water treatment facility storage tank	WTB 2015		Santa Fe, City of		FY16		$1,500,000	

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JyS ID	County	Regional or System Specific	Strategy Type	Strategy Approach	Subcategory	Project Name	Source of Project Information	Description	Project Lead	Partners	Fiscal Year	Phase	Cost	Need or Reason for the Project, Program, or Policy
121	SF	SS	PJ	Mitigate Drought, Increase supply	Drill New Wells	Back-up well field	SFCO Utilities, June 2015	Provide backup water supply for Santa Fe County water utility customers; acquire in-basin gw rights as necessary	Santa Fe County	CiSF coordination	FY18	Planning		Necessary to provide a backup water supply for the County utility
122	SF	SS	PJ	Improve System Efficiency	Resource Management	Santa Fe County Water and Wastewater Master Plan	SFCO Utilities, June 2015	Optimize existing resources, and plan for the future	Santa Fe County		FY16	Current		Comprehensive study of the county's water sources, storage, treatment, and delivery systems that will be used to guide future water utility decisions
123	SF	SS	PJ	Protect Existing Supplies	Wastewater	Quill Wastewater Treatment Facility Replacement	SFCO Utilities, June 2015	Replace WWTP and expand collection system to transport wastewater to Quill or other regional WW treatment options	Santa Fe County		FY18	Planning	$8M	Needed to replace antiquated treatment plant to produce higher quality reclaimed water for reuse
124	SF	SS	PJ	Protect Existing Supplies	Water Treatment	Uranium Treatment	Lucero, 2015		Canada de los Alamos MDWCA					
125	SF	SS	PJ/ PM	Protect Existing Supplies	Streamflow, aquifer recharge, water quality	Santa Fe River target flow monitoring	Erdmann, 2015	Streamflow monitoring related to "Living River" target flows. Subsequently, monitoring the shallow aquifer to understand surface water/groundwater recharge. Furthermore, conduct water quality monitoring related to storm water during Santa Fe River, "living river" target flows.	City of Santa Fe	Office of the State Engineer, NMED Surface Water Quality Bureau, USEPA Region VI	FY15-16, FY16-17.	Development		The monitoring of the streamflow of the "Living River" target flows are a requirement of Ordinance 2012-10. The administrative procedures of the ordinance advise both shallow aquifer monitoring and water quality monitoring of storm water flows to the Santa Fe River.
126	SF	SS	PM	Reduce Demand	Conservation	Outdoor Water Use Restrictions	Erdmann, 2015	The City of Santa Fe restricts the times of day for outdoor watering in order to conserve water and encourage efficient outdoor irrigation practices.	City of Santa Fe		ongoing	Ongoing	n/a	
127	SF	SS	PM	Reduce Demand	Conservation	Water Budget Allocation Office - Plan B	Erdmann, 2015	Builders proposing new construction must provide to, or purchase from, the city a sufficient quantity of water rights to cover the additional use caused by the project. Plan B is a way in which the City incentivizes water smart projects by allowing developers to reduce the amount of water rights they'll have to provide via constructing projects with reduced water demand.	City of Santa Fe		ongoing	Ongoing	n/a	
128	SF	SS	PM	Reduce Demand	Conservation	Retrofit Rebate Credit Program	Erdmann, 2015	Homeowners are able to apply for rebates upon purchase of approved water conserving fixtures and appliances.	City of Santa Fe		ongoing	Ongoing	$ 200,000.00	

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JyS ID	County	Regional or System Specific	Strategy Type	Strategy Approach	Subcategory	Project Name	Source of Project Information	Description	Project Lead	Partners	Fiscal Year	Phase	Cost	Need or Reason for the Project, Program, or Policy
129	SF	SS	PM	Increase Water Supply	Water Rights	Supply Augmentation	Erdmann, 2015	Increase supply - acquire additional native or SJCP rights, tap into unused "peaking" capacity of BDD, and fully utilize the permitted 25% in excess of 5,230 AFY	City of Santa Fe	None	Ongoing	Ongoing	unknown	
130	SF	SS	PM	Reduce Demand	Data Collection	Water Loss Audit	Erdmann, 2015	Evaluate the City Water System to identify line losses in order to understand losses and to prioritize repairs.	City of Santa Fe		FY 16	Design	$ 130,000.00	This project is going to be completed on a regular basis, including this year and upon completion of the meter replacement in order to better determine the impact of the meter replacement project in accounting for the full water use in the city.
131	SF	SS	PM	Protect Existing Supplies	Planning	Well Field Optimization	Erdmann, 2015	Conduct a study to evaluate sustainable levels of well use for optimal use of the resource.	City of Santa Fe				$ 150,000.00	
132	SF	SS	PM	Reduce Demand	Conservation	Rebate Credit Program	Erdmann, 2015	Rainwater harvesting rebates Irrigation efficiency evaluation and equipment rebates Rainwater Harvesting Rebates and Irrigation Efficiency Evaluation and Equipment Rebates	City of Santa Fe	QWEL Program-Santa Rosa Utilities, EPA WaterSense, NMWCA	ongoing	Ongoing	$ 200,000.00	
133	SF	SS	PM	Reduce Demand	Conservation	Rebate Credit Program	Erdmann, 2015	Industrial, Commercial and Institutional Customers can work with the Water Conservation Office to customize a rebate for the replacement and/or upgrade of water using technology to improve water efficiency.	City of Santa Fe		FY16	Development	$ 200,000.00	
134	SF	SS	PM	Reduce Demand	Conservation	Children's Water Fiesta	Erdmann, 2015	2 day educational program that reaches approximately 600 4th grade students from SFPS.	City of Santa Fe	SF Public Schools, Valles Caldera, NMED-SWQ, CH2MHill, City of Rio Rancho, NM OSE, BDD, Bur of Rec, SF County Cooperative Extension Service, NM Game & Fish, CRWTP, Ogallala Commons, Waste Water Management, Sandia National Laboratories, LA County	ongoing-13th year	Ongoing	$ 15,000.00	

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JyS ID	County	Regional or System Specific	Strategy Type	Strategy Approach	Subcategory	Project Name	Source of Project Information	Description	Project Lead	Partners	Fiscal Year	Phase	Cost	Need or Reason for the Project, Program, or Policy
135	SF	SS	PM	Reduce Demand	Conservation	Children's Poster Contest	Erdmann, 2015	Annual Water Conservation Poster Contest for 1-6 graders	City of Santa Fe		ongoing-12th year	Ongoing	$ 12,000.00	
136	SF	SS	PM	Reduce Demand	Conservation	Qualified Water Efficient Landscaper (QWEL) training and certification	Erdmann, 2015	EPA certified training offered twice a year to landscape professionals	City of Santa Fe	NMWCA	ongoing-3rd year	Ongoing	$ 5,000.00	
137	SF	SS	PM	Reduce Demand	Conservation	Fix A Leak Week (Flapper Friday), Spooky Showerhead Swap	Erdmann, 2015	Provide literature and other give-away items (new low-flow showerheads, new universal toilet flappers) to City of Santa Fe Water Customers	City of Santa Fe	EPA WaterSense, NM OSE	ongoing	Ongoing	$ 8,000.00	
138	SF	SS	PM	Reduce Demand	Conservation	Project WET workshop	Erdmann, 2015	Provide training, curriculum guides to teachers and environmental educators	City of Santa Fe	Project WET, EEANM	Ongoing	Ongoing	$ 1,000.00	
139	SF	SS	PM	Improve System Efficiency	Metering	purchase/install water meters	WTB 2015		Tesuque Pueblo		FY16		$479,626	
140	SF	SS	PM	Increase Water Supply	Transfer Water Rights	Acquire Middle Rio Grande surface water rights for Buckman Direct Diversion	SFCO Utilities, June 2015	Current SFCo policies require SFCo Utilities and/or developers to acquire water needed for developments	Santa Fe County		FY17			
141	SF	SS	PY	Protect Existing Supplies	Planning	Alternative Development of inchoate water rights	Erdmann, 2015	Increase supply - engage OSE to fully developed inchoate permitted water rights in City and Buckman Wells	City of Santa Fe	New Mexico Office of the State Engineer	FY16	Development	n/a	
142	SF	SS	PY	Protect Existing Supplies	Conservation, Water Rights	Update City Ordinances to reflect current priorities and goals for water management and conservation	Erdmann, 2015	Policy - update, modernize, and streamline applicable sections of Chapter 25 of City Code	City of Santa Fe	None	Ongoing	Ongoing	n/a	In order to keep up with changes in water management practices and technology, the relevant City Laws require revision and regular review.
143	SF	SS	PJ	Protect Existing Supplies	Planning	Watershed Plan for Lower Santa Fe River	Otto, 2016	Optimize Existing Resources	SF Watershed Assoc.	SF County	FY16		$120,000	
144	SF	SS	PJ	Protect Existing Supplies	Watershed Restoration	Watershed Restoration for Lower Santa Fe River	Otto, 2016	Increase supply	SF Watershed Assoc.	SF County	FY17		$600,000	
145	SF	R	PM	Protect Existing Supplies	Watershed Restoration/Wildfire Risk Reduction	Planning for Resilience and Restoration in the Greater Santa Fe Fireshed	Lyons, 2016	Develop and deliver NEPA-ready products to the Espanola Ranger District and Tesuque Pueblo so that they can then prepare NEPA decisions and then begin activities to reduce wildfire and watershed risk. Santa Fe and the surrounding mountains and communities from Glorieta and Apache Canyon in the south to Rio en Medio and Chupadero in the north represents the Greater Santa Fe Fireshed (GSFF).	Forest Guild	Santa Fe National Fo	FY16	Planning/Development	$225,000	
146	RA	SS	PJ	Improve System Efficiency	Water System Infrastructure	Maintenance or Replacement of Existing PRVs	Martinez. 2016		City of Espanola					
147	RA	SS	PJ	Improve System Efficiency	Water System Infrastructure	Riverside Drive Utility Upgrade From Dandy Burger to Fairview Lane	Martinez. 2016		City of Espanola					

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JyS ID	County	Regional or System Specific	Strategy Type	Strategy Approach	Subcategory	Project Name	Source of Project Information	Description	Project Lead	Partners	Fiscal Year	Phase	Cost	Need or Reason for the Project, Program, or Policy
148	RA	SS	PJ	Improve System Efficiency	Water System Infrastructure	Construction of Waste Water Line on North Prince Drive	Martinez. 2016		City of Espanola					
149	RA	SS	PJ	Improve System Efficiency	Water System Infrastructure	Infrastructure of Water and Waste Water Line Upgrades on West Side of town	Martinez. 2016		City of Espanola					
150	RA	SS	PJ	Improve System Efficiency	Water System Infrastructure	Construction North El Llano Water Line	Martinez. 2016		City of Espanola					
151	RA	SS	PJ	Improve System Efficiency	Water System Infrastructure	Construction South El Llano Water Line	Martinez. 2016		City of Espanola					
152	RA	SS	PJ	Improve System Efficiency	Water System Infrastructure	Modification to Existing Carbon Dioxide Building Arsenic Treatment Plat Well #1	Martinez. 2016		City of Espanola					
153	RA	SS	PJ	Improve System Efficiency	Water System Infrastructure	Replacing of Existing Problematic Galvanized 2" Water Lines of Hunter Street, Questa Lane, and East Solano	Martinez. 2016		City of Espanola					
154	RA	SS	PJ	Improve System Efficiency	Water System Infrastructure	North McCurdy Road Water Line Replacement	Martinez. 2016		City of Espanola					
155	RA	SS	PJ	Improve System Efficiency	Water System Infrastructure	ICIP Request New Radio Read and Meter System	Martinez. 2016		City of Espanola					
156	RA	SS	PJ	Improve System Efficiency	Water System Infrastructure	Install Scada System for All Wells	Martinez. 2016		City of Espanola					
157	RA	SS	PJ	Improve System Efficiency	Water System Infrastructure	Clean, Paint, and Inspection of Existing Water Tanks	Martinez. 2016		City of Espanola					
158	RA	SS	PJ	Improve System Efficiency	Water System Infrastructure	Replace Altitude Valve at Industrial Park South Well #2	Martinez. 2016		City of Espanola					
159	RA	SS	PJ	Improve System Efficiency	Water System Infrastructure	Replacement of outdated Fire Hydrants	Martinez. 2016		City of Espanola					
160	SF	SS	PJ	Protect Existing Supplies	Wastewater	Agua Fria Village Utility Sewer Expansion	ICIP, FY 2017-20	Extend municipal wastewater service to replace septic tanks	Aqua Fria Village	NMED, City of Santa	2017-2021		$ 1,000,000	The residents of the Agua Fria area are requesting funding to extend municipal wastewater services to serve the area. The extension of wastewater collection service would serve residential and commercial areas of the community. The project would provide for safer wastewater collection and eliminate the reliance in the area on septic systems and the related risk of groundwater contamination. A preliminary engineering report to develop a prioritized list of areas to design and construct is underway.
161	SF	SS	PJ	Improve System Efficiency	Water System Infrastructure	Water Line along State Route 14	ICIP, FY 2017-2021				2017-2021		$ 4,400,000	
162	SF	SS	PJ	Improve System Efficiency	Water System Infrastructure	Water Supply Improvements on Caja del Oro	ICIP, FY 2017-2021				2017-2021		$ 200,000	

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JyS ID	County	Regional or System Specific	Strategy Type	Strategy Approach	Subcategory	Project Name	Source of Project Information	Description	Project Lead	Partners	Fiscal Year	Phase	Cost	Need or Reason for the Project, Program, or Policy
163	SF	SS	PJ	Protect Existing Supplies	Storm Water	Storm Water Improvement for Camino Chupadero	ICIP, FY 2017-2021		Chupadero Water & Sewer Corp		2017-2021		$ 332,900	
164	SF	SS	PJ	Protect Existing Supplies	Wastewater	Utilities Quill Plant Improvement	ICIP, FY 2017-2021				2017-2021		$ 1,500,000	
165	RA	SS	PJ	Improve System Efficiency	Water System Infrastructure	Upgrade Tribal Water System	ICIP, FY 2017-2021		Santa Clara Pueblo		2017-2021		$ 9,300,000	
166	RA	SS	PJ	Improve System Efficiency	Water System Infrastructure	Wastewater	ICIP, FY 2017-2021		Santa Clara Pueblo		2017-2021		$ 13,300,000	
167	RA	SS	PJ	Protect Existing Supplies	Water System Infrastructure	Irrigation System Water Storage	ICIP, FY 2017-2021		Santa Clara Pueblo		2017-2021		$ 1,400,000	
168	RA	SS	PJ	Protect Existing Supplies	Water System Infrastructure	Upgrade Irrigation System	ICIP, FY 2017-2021		Santa Clara Pueblo		2017-2021		$ 12,463,000	

Appendix 8-B

Forest Restoration Projects in the Jemez y Sangre Water Planning Region

Appendix 8-B. USFS Collaborative Forest Restoration Projects in the Jemez y Sangre Water Planning Region

Lead Organization	Project Title	Funding ($)			Year Funded	Sub-basin
		USFS	Match	Total		
Aspen Forest Products	Borrego Mesa Restoration Projects and Documentary	360,000	90,000	450,000	2010	Santa Cruz
Santa Fe County Fire Department	Engaging Communities in Wildfire Prevention	342,514	85,628	428,142	2010	Santa Fe
Chimayo Conservation Corps	Chimayo Conservation Corps Training Local Young Adults in Three Forest Types	360,000	90,000	450,000	2010	Santa Cruz
WildEarth Guardians	Santa Fe Canyon Riparian Forest Restoration NEPA Clearance	119,992	30,000	149,992	2009	Santa Fe
Santa Fe Watershed Association	Santa Fe Municipal Watershed Restoration Project: Demonstrating Community Collaboration in Long Term Watershed and Financial Management	63,774	20,000	83,774	2007	Santa Fe
Santa Clara Pueblo	Beaver Habitat Restoration in the Jemez Mountains	171,455	90,000	261,455	2007	Santa Clara
Arizona Board of Regents, UofA	Little Tesuque-Black Canyon Watershed Restoration Project	321,132	88,431	409,563	2006	Tesuque
Santa Clara Pueblo	Wood Biomass Heating Design and Implementation of Santa Clara Pueblo South Housing	359,656	90,000	449,656	2006	Santa Clara
Ohkay Owingeh	Birds in the Bosque-Restoration Effects on Avian Habitat	359,656	90,000	449,656	2006	Santa Clara
University of Arizona	Little Tesuque-Black Canyon Watershed Restoration Project	321,132	88,431	409,563	2006	Tesuque
Regenesis Collaboration Development Group	Rio Pojoaque Forest and River Restoration Project	241,371	78,990	320,361	2006	Pojoaque
Ohkay Owingeh	Inter-Tribal Bosque Restoration along the Rio Grande	359,957	90,000	449,957	2005	Velarde
New Mexico Recycling Coalition	Outreach and Education to Enhance the Utilization of Compost and Mulch from Forest Residuals	187,863	48,276	236,139	2005	Santa Fe
Santa Fe County	Tree Thinning in Wildland Urban Interface	360,000	90,000	450,000	2004	Santa Fe
El Greco	Non-Traditional Uses for Forest Products for Traditional Communities	356,563	—	356,563	2003	Velarde
Pueblo of Tesuque	Restoration of Historic Fire Regimes along the Rio Tesuque and Arroyo Cuma within the Pueblo of Tesuque	360,000	—	360,000	2003	Tesuque

Source: Collaborative Forest Restoration Program (CFRP) (http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprd3829559.pdf)

Appendix 8-B. USFS Collaborative Forest Restoration Projects in the Jemez y Sangre Water Planning Region

Lead Organization	Project Title	Funding ($)			Year Funded	Sub-basin
		USFS	Match	Total		
Santa Clara Pueblo	The Santa Clara Woodworks Small Log project	357,400	—	357,400	2003	Santa Clara
Pojoaque Pueblo	Riparian Forest Restoration Project	360,000	—	360,000	2003	Pojoaque
San Ildefonso Pueblo	Rio Grande Floodplain Rehabilitation Project	360,000	—	360,000	2003	Pojoaque
Ohkay Owingeh	Reduce fire danger on 210 acres of riparian forest along Rio Grande	359,979	—	359,979	2002	Santa Cruz
Santa Clara Pueblo	Santa Clara Pueblo-Valle Caldera Reforestation	344,652	—	344,652	2002	Santa Clara
Eight Northern Indian Pueblo Council	Eight Northern Indian Pueblo Council, Inc. Forest Restoration Program	118,800	—	118,800	2001	Velarde Santa Clara Pojoaque-Nambe
	Total	6,545,896		7,615,652		

Source: Collaborative Forest Restoration Program (CFRP) (http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprd3829559.pdf)

Appendix 8-B. NMED 319 Program Projects in the Jemez y Sangre Water Planning Region

Lead Organization	Project Title	Grant Number	Funding ($)			Completed	Sub-basin
			EPA	Match	Total		
Santa Fe Watershed Association	Santa Fe River Watershed Restoration Action Strategy	00-D	47,398	37,272	84,640	2004	Santa Fe
State Land Office	Improve channel stability in ephemeral reach of the Santa Fe River	99-L	143,840	106,628	250,468	2003	Santa Fe
State Land Office	Santa Fe River Restoration Project, Phase II	01-M	89,000	90,995	179,995	2006	Santa Fe
US Forest Service	Caja del Rio/Santa Fe River watershed improvement project	99-N	190,894	128,055	318,949	2004	Santa Fe
City of Santa Fe/USFS	Upper Santa Fe Watershed Restoration Project: Thinned 6,000 acres	00-D	371,866	336,251	708,117 [a]	2005	Santa Fe
Forest Guardians	Implementation of NPS pollution control in the Santa Fe River-below wastewater treatment plant	00-E	144,650	155,750	300,400	2004	Santa Fe
Earth Works Institute	Galisteo Watershed Restoration	00-F	119,102	121,332	240,434	2002	South Galisteo
Earth Works Institute	Galisteo Watershed Restoration Project, Phase II	02-F	267,966	185,780	453,746	2005	South Galisteo
Santa Fe Botanical Gardens	Santa Fe Botanical Garden and Las Golondrinas: Reduce sedimentation and control invasive and noxious plant species	01-N	100,000	76,473	176,473	2004	Santa Fe
Pajarito Plateau Watershed Partnership	Pajarito Plateau Watershed Restoration, including burned areas of the Cerro Grande fire	01-R	50,000	77,000	127,000	2005	Los Alamos
Los Alamos County	Development of a stormwater management plan for Los Alamos County and implementation measures in the Pueblo Watershed	04-A	148,000	208,500	356,500	2004	Los Alamos
Forest Guardians	La Cieneguilla Open Spaces/ Santa Fe River Restoration	05-E	114,275	0	187,825	2005	Santa Fe

[a] Also received Congressional funding

Appendix 8-B. NMED 319 Program Projects in the Jemez y Sangre Water Planning Region

Lead Organization	Project Title	Grant Number	Funding ($)			Completed	Sub-basin
			EPA	Match	Total		
Keystone Environmental Restoration	Post-Fire Restoration of the Rito de los Frijoles at Bandelier National Monument Visitors' Center (RSP)	15-N	0	143,215	143,215	2018	Los Alamos
Los Amigos de Valle Caldera	Restoring Hydrologic Functioning to the Rito de los Indios, Valles Caldera National Preserve (RSP)	15-L	0	172,000	172,000	2018	Los Alamos
Rio Grande Return	Rio Grande Corridor at Buckman Phase II (RSP)	15-O	0	149,019	0	2018	Caja del Rio

Appendix 8-C

Reduction in Water Supply-Demand Gap Since Completion of the 2003 Jemez y Sangre Regional Water Plan

Appendix 8-C. Reduction in Water Supply-Demand Gap since Completion of the 2003 Jemez y Sangre Regional Water Plan

As outlined in Section 8.1.1, the 2003 *Jemez y Sangre Regional Water Plan* (RWP) (DBS&A and Lewis, 2003) recommended several possible alternatives for closing the gap between supply and demand within the non-agricultural categories. The purpose of this appendix is to describe the alternatives that have been implemented since the 2003 Jemez y Sangre accepted plan was published and assess their effectiveness in addressing the gap.

In the 2003 RWP, the supply-demand gap for 2060 was calculated for 10 sub-basins by comparing future water use projections to available supply. Future use projections were based on population growth projections and the per capita water use in 2000. The available supply was based on the water diverted in 2000 and knowledge of the water rights and water availability at that time. A supply-demand gap exists when future demand exceeds estimated future supply. Each sub-basin was evaluated based on the ability to meet future demands. For instance, the Los Alamos sub-basin had sufficient capacity in their water supply wells to meet future demands, so no gap was estimated in 2060. Conversely, at the time the 2003 RWP was prepared, the City of Santa Fe was struggling to meet existing demand and was restricting outdoor watering to once a week. Details of the available supply and options in each sub-basin are described in the 2003 RWP.

Since 2000, however, the projections regarding population growth, upon which the non-agricultural water use projections are largely based, have been called into question based on the actual population growth from 2000 to 2010 reported in the 2010 Census, which showed less population growth than predicted in the 2003 RWP. In addition, implementation of alternatives recommended in the 2003 plan has impacted the available supply and the projected demand, thus also affecting the projected gap in 2060.

Section 8-C.1 briefly summarizes the changes in growth and the implementation of alternatives presented in the 2003 Water Plan and how these have affected the revised projections of the gap between supply and demand within the non-agricultural categories. These sections summarize the overall reduction in the projected gap for 2060 for the entire Jemez y Sangre region; the details for each of the subregions are provided in Section 8-C.2. The 2003 RWP divided the Jemez y Sangre region into ten watersheds or sub-basins. For estimating the supply-demand gap, some of the sub-basins were grouped to form subregions because of the shared water resources.

8-C.1 Estimated Reduction in Predicted Supply-Demand Gap for 2060

The 2003 RWP-projected supply-demand gap of 32,000 ac-ft/yr in 2060 has been reduced 13,300 ac-ft/yr by a variety of strategies implemented throughout the region. (The gap will be further reduced if the rate of population growth continues as described in Section 6.3). By

analyzing the reduction in water use through adjustments to the projected growth, conservation efforts, transfers of water rights, new domestic wells, and use of San Juan-Chama (SJC) water, the overall gap in water supply and demand in 2060 for the non-agricultural sector has been reduced by 41 percent. Table 8-C1 shows the population of each of the five subregions, the 2010 predicted population in 2000, and the actual population in 2010. Table 8-C2 summarizes the calculated reduction in the supply-demand gap as of 2010 for each of the subregions.

Table 8-C1. Summary of Projected and Census Population for 2010

Subregion	Population (Census-block totals) 2000	Population (Census-block totals) 2010	2010 Predicted (2003 RWP) "Most-Likely"	Difference Between Predicted and Census 2010	Growth Management (Growth Correction) [a] (ac-ft/yr)
Northern	29,612	30,780	33,730	–2,950	443
Aamodt	11,139	9,955	14,457	–4,502	675
Los Alamos	19,758	18,531	20,509	–1,978	0
Santa Fe Area	99,335	112,567	118,622	–6,055	1,108
South Galisteo	2,903	2,579	3,608	–1,029	154
Total	162,747	174,412	190,926	–16,514	2,380

[a] Growth management (growth correction) represents the difference in the projected growth by 2010 and the actual growth. (Specific strategies to limit growth were not analyzed). The reduction in population between the projected growth and the actual growth was converted into ac-ft/yr to estimate the reduction in the gap between supply and demand.

The population projections prepared for the Jemez y Sangre Water Planning Council (JySWPC) by the University of New Mexico Bureau of Business and Economic Research (BBER) in 1999 (BBER, 2000) showed a projected regional growth of 200,000 people in 2060 (from 160,000 to 360,000), equating to an additional water demand of 31,500 acre-feet per year (ac-ft/yr) at the year 2000 levels of consumption.

8-C.1.1 Growth Management (Growth Correction)

Growth management techniques include designating geographical limits for growth, conducting project-level analyses for each development, or setting numerical limits on the rate of growth (all discussed in the 2003 RWP). Such measures have been shown to have a maximum effectiveness of 50 percent, based on the effectiveness of measures implemented in other communities to control growth as discussed in White Paper 18 in the 2003 RWP (DBS&A and Lewis, 2003, Appendix F). Achieving such a reduction would require regional cooperation and political support. Santa Fe County's minimum lot sizes, and Eldorado Subdivision's moratorium on construction could have impacted growth, but the JySWPC has not attempted to analyze any policy impacts on growth, only to compare the predicted population for 2010 with the 2010 Census.

Table 8-C2. Summary of Actions and Changes to Reduce the Supply-Demand Gap in the Non-Agricultural Sectors.

Strategy to Close Supply-Demand Gap	Reduction in Water Supply-Demand Gap (ac-ft/yr)					
	Northern	Aamodt	Los Alamos	Santa Fe Area	South Galisteo	Total
Water supply-demand gap by 2060 predicted in 2003 RWP [a]	*4,228*	*6,249*	*0*	*19,900*	*1,856*	*32,233*
Growth management [b] *(growth correction)*	*443*	*675*	*0*	*1,108*	*154*	*2,380*
Conservation	427	(31)	0	6,034	14	6,444
New domestic wells	149	156	0	159	69	533
Transfer of agricultural water rights to M&I	0	1,577	0	1,024	0	2,601
San Juan-Chama Project water	0	1,079	0	0	NA	1,079
Nambe Pueblo reserve rights	NA	302	NA	NA	NA	302
Total gap reduction as of 2010	1,019	3,758	0	8,325	237	13,339
Percentage reduction	*24%*	*60%*	*0*	*42%*	*13%*	*41%*
Updated water supply-demand gap by 2060	*3,209*	*2,491*	*0*	*11,575*	*1,619*	*18,894*

[a] DBS&A and Lewis, 2003

[b] Table C-1 Growth management (growth correction) represents the difference in the projected growth by 2010 and the actual growth. (Specific strategies to limit growth were not analyzed). The reduction in population between the projected growth and the actual growth was converted into ac-ft/yr to estimate the reduction in the gap between supply and demand.

ac-ft/yr = Acre-feet per year
M&I = Municipal and industrial

The population projections for the 2003 Regional Water Plan consisted of a "Most Likely" projection, covering the period from 2000 through 2060. The 2010 Census population was compared to the 2003 RWP-predicted population for 2010 for each subregion. In all cases, the population in 2010 was less than predicted (Table 8-C1), and 8.6 percent lower overall for the entire region.

The high population projections presented in Section 6 show a total population of 331,700 by 2060, or 28,300 fewer people than projected with the "most likely" population projection in the 2003 RWP. This represents a decline of 0.3 percent, a reduction in growth from 2.0 percent to 1.7 percent. The revised projections presented in Section 6 are not presented by subregion; thus the assessment of the growth correction considers only the region as a whole.

The difference in the predicted and actual population in 2010 was used to calculate the impact on the supply-demand gap, that is, to estimate the reduction in the gap for 2060 from the 2003 projection; the adjusted demand based on revised population is presented as the "growth correction." If the growth rate changes in the future, obviously, the impact of the growth

correction will change. Thus, this calculation only examines the difference between the projected (2003 RWP) and census population in 2010.

The reduction in the number of people in each subregion equates to a reduction in water demand of 2,380 ac-ft/yr (Table 8-C1), or about 7 percent of the originally predicted gap (2003). The reduction in water demand was based on a rate of 0.15 acre-feet per year per person in each subregion, except in the Santa Fe subregion, for which the rate was 0.18 ac-ft/yr based on the rates used in the 2003 RWP.

8-C.1.2 Conservation

The 2003 water plan focused on the conservation potential for public water systems because the projected public (non-agricultural) categories' gap between supply and demand is highly sensitive to improvements in conservation. Conservation by new and existing public water system customers could result in the approximate potential water savings of 15 to 30 percent for indoor use and 40 to 50 percent for outdoor use. Since beginning to pursue municipal water conservation in earnest in the early 2000s, per capita usage has dropped by as much as 30 percent, a greater margin than anticipated, resulting in diminished total demand despite increasing population. The impact of conservation measures on the reduction in the supply-demand gap for 2060 from the one predicted in the 2003 RWP was calculated for each subregion by examining the changes in per capita water use. Utilizing the analysis of public water systems' per capita water use presented by Lewis et al. (2013), the change from 2000 to 2010 in the average weighted per capita demand for public water systems in each of the subregions was estimated to assess the impact of conservation measures. The conservation savings achieved in just ten years was estimated to reduce the projected supply-demand gap in 2060 by 6,444 ac-ft/yr for the Jemez y Sangre region, a reduction of 14 percent.

8-C.1.3 Transfer of Agricultural Water Rights to Non-Agricultural Rights

A total of 2,601 ac-ft/yr of water rights have been transferred out of agriculture, representing a reduction of 8 percent in the 2060 projected gap between supply and demand. An additional 302 ac-ft/yr of Nambe Pueblo Reserved Rights were also added to the portfolio of water supply for the Aamodt subregion.

The discussion of the transfer of agricultural water rights described in the 2003 RWP alternatives clarifies the source of the agricultural rights as above or below the Otowi gage. The Otowi gage on the Rio Grande serves as a measuring point for calculating New Mexico's obligation under the Rio Grande Compact for delivery of water to Texas. Historically, the State Engineer has denied applications to transfer locations of water rights diversions across this gage to avoid the necessary changes that would be required for Rio Grande Compact accounting; thus this option was considered to be very uncertain.

8-C.1.4 Domestic Wells

While greater depletions from groundwater are not desirable in many areas, new domestic wells are legal and are the only available water supply for many individuals. However, in some cases, domestic wells are not permitted, for example, where a municipality has restricted drilling of wells within a specified distance of a public water system. Domestic wells are likely to continue to increase the stress on aquifers unless state law is changed to better protect senior water rights and to disallow domestic wells where connection to a public water system is a reasonable option.

In order to estimate the change in water use from domestic wells, the number of newly permitted wells (post-1999 wells) was evaluated by subregion. The increase in domestic use was estimated using ArcGIS and data from the NMOSE WATERS database compiled for the 2013 study, resulting in an estimated 1,570 new wells. Some of the post-1999 wells may be replacement wells, thus over-estimating the new diversions from this category. The per capita increased water use for the new domestic wells was based on the 2003 plan (0.15 ac-ft/yr) or the revised estimate by Lewis et al. (2013) and the household size from the 2010 Census for each subregion.

8-C.1.5 San Juan-Chama Project Water

A total of 1,079 ac-ft/yr of SJC water was authorized for the Aamodt subregion, closing the overall regional gap by 3 percent.

8-C.2 Water Supply-Demand Gap Reduction by Subregion

8-C.2.1 Northern Subregion (Velarde, Santa Clara, and Santa Cruz River Sub-basins)

The 2003 RWP shows a supply-demand gap of 4,228 acre-feet by 2060 for the Northern subregion. The current overall estimated gap in 2060 is 3,209 acre-feet. The reduction from the 2003 RWP-projected gap of 24 percent was achieved through water conservation, new domestic wells, and a revised population projection.

8-C.2.1.1 Northern Subregion: Growth Correction

Population is not growing at the rate predicted in 2003. As of 2010, the population of the Northern subregion increased by 1,168 people, whereas the Jemez y Sangre 2003 plan predicted an increase of 4,118 people by 2010. This difference of 2,950 people represents approximately 443 acre-feet of water demand, thus reducing the gap by 10 percent.

8-C.2.1.2 Northern Subregion: Conservation

Per capita demand for public water systems has declined from 107 to 78 gallons per capita per day (gpcd) for public water systems in the Northern Subregion, thus reducing the gap in 2060 by 427 acre-feet, or 10 percent of the gap predicted by 2060 in the 2003 RWP.

8-C.2.1.3 Northern Subregion: Domestic Wells

A third of the gap in the Northern subregion could be closed with domestic wells due to the proximity to shallow stream-connected aquifers. From 2000 through 2011, an estimated 390 new wells were permitted, which with an average household size of 2.55 and per capita use of 0.15 ac-ft/yr (134 gpcd), equates to a 149-ac-ft/yr increase or 4 percent of the 2003 RWP-projected 2060 supply-demand gap.

8-C.2.1.4 Northern Subregion: Transfer Agricultural Water Rights Below Otowi Gage

All of the projected supply-demand gap in the Northern subregion could theoretically be met by retiring approximately 1,363 acres of land in the Middle Rio Grande Conservancy District (MRGCD). No transfers have occurred to date and future transfers from below the Otowi gage to above the gage are unlikely due to Rio Grande Compact accounting (Section 8-C.1.3).

8-C.2.1.5 Northern Subregion: Transfer Agricultural Water Rights Above Otowi Gage

Water rights located above this gage, in the Northern subregion, can be transferred to other diversion points above the gage without compromising the Rio Grande Compact. The entire gap could be met with transfers of 3,250 acres of land, or about 16 percent of the irrigated rights in the Jemez y Sangre region. No transfers from agriculture have occurred since 2000 (Section 8-C.1.3).

8-C.2.1.6 Northern Subregion: Utilize San Juan-Chama Project Water

The City of Española's 1,000 acre-feet and Ohkay Ohwingeh's 2,000 acre-feet of SJC water are more than enough to meet the projected demands of the Northern subregion. The SJC water is currently leased to the Bureau of Reclamation and will be available to meet future demands as needed.

8-C.2.2 Los Alamos Sub-basin

The Los Alamos sub-basin showed no projected gap due to the available water rights, which was more than enough to meet the projected demand. However, Los Alamos is pursuing diversion of 1,200 acre-feet of SJC water to shift the water supply from the deep regional aquifer to renewable surface water.

Per capita demand has declined from 224 gpcd in 2000 to 217 gpcd in 2010.

8-C.2.3 Aamodt Subregion (Pojoaque-Nambe and Tesuque Sub-basins)

The 2003 Jemez y Sangre plan showed that the Aamodt Subregion would have a gap of 6,250 acre-feet by 2060. The overall gap in 2060 is currently estimated to be 2,491 acre-feet. The reduction in the gap of 60 percent was achieved through new domestic wells, a revised population projection, and proposed transfers of native and SJC water.

This subregion includes private landowners and the pueblos of Nambe, Pojoaque, Tesuque, and San Ildefonso. The Aamodt adjudication began in 1966 and a Settlement Agreement was signed on May 3, 2006 that, if adopted by Federal Court (SFC, 2012) will resolve the pueblo water rights claims and develop the Pojoaque Basin Regional Water System (Section 4.1.3.5). Under the Settlement, the United States will acquire 2,500 acre-feet of water rights to serve the pueblos, and Santa Fe County will acquire up to 1,500 acre-feet of water (diverted from the Rio Grande) to serve non-pueblo customers within the Basin.

8-C.2.3.1 Aamodt Subregion: Growth Correction

Population is not growing at the rate predicted in the 2003 Plan. As of 2010, the population decreased by 1,184 people, whereas the Jemez y Sangre 2003 RWP predicted an increase of 3,318 people by 2010. This difference of 4,502 people represents approximately 675 acre-feet of water demand, thus reducing the gap by 11 percent.

8-C.2.3.2 Aamodt Subregion: Conservation

Per capita demand for public water systems in the Aamodt Subregion averaged 96 gpcd in 2010 (Lewis et al., 2013), an increase over the rate in 2000 of 89 gpcd. This increase in per capita rate increases the projected gap in 2060 by 31 acre-feet or 0.5 percent.

8-C.2.3.3 Aamodt Subregion: Domestic Wells

Domestic wells were not considered an option in the Aamodt Subregion due to the current limitations on domestic wells imposed by the adjudication court and further restrictions called for in the settlement agreement, including closing the Pojoaque Basin to new appropriations. However, since 2000, 272 new wells have been drilled, with an estimated diversion of 156 ac-ft/yr (household size of 2.29 and a per capita rate of 0.25 ac-ft/yr [223 gpcd] [Lewis et al., 2013]), closing the projected gap by 3 percent. (In the future, groundwater pumping by domestic wells could be reduced when homeowners connect to the Pojoaque Basin Regional Water System. Because this is a transfer from an existing use of groundwater within the basin, it does not close the gap. It does, however, reduce the stress on the local stream-connected aquifer system and reduce surface water shortages for existing agricultural demands.)

8-C.2.3.4 Aamodt Subregion: Transfer Agricultural Water Rights Below Otowi Gage

All of the projected supply-demand gap in the Aamodt Subregion could theoretically be met by retiring approximately 2,000 acres of land in the MRGCD. No transfers have occurred to date (Section 8-C.1.3).

8-C.2.3.5 Aamodt Subregion: Transfer Agricultural Water Rights Above Otowi Gage

Water rights with points of diversion above the Otowi gage can be transferred to other diversion points above the gage without compromising the Rio Grande Compact. The entire gap in the Aamodt Subregion could be met with transfers of water rights from 4,800 acres of land, or about

24 percent of the irrigated rights in the Jemez y Sangre region. Applications to transfer 1,752 acre-feet from the Top of the World farm in Taos County to the Pojoaque Regional Water System have been submitted by Santa Fe County (611 acre-feet), the United States, and the four pueblos (1,141 acre-feet owned by the United States and held in trust for the pueblos). Nambe Pueblo reserved water rights of 302 acre-feet are also proposed to be transferred to the Pojoaque Basin Regional Water System. In combination, these water rights transfers would reduce the gap in 2060 by 30 percent when the system is completed by 2024 (Bushnell, 2014).

8-C.2.3.6 Aamodt Subregion: Utilize San Juan-Chama Project Water

Lease of Jicarilla Apache SJC water was proposed as an alternative for the Aamodt Subregion, which could reduce the gap by 50 percent. If return flow credits were also exercised on this leased water, the remaining 50 percent of the gap could be closed. The Pojoaque Basin Regional Water System will include 1,079 acre-feet of previously uncontracted SJC water for the pueblos as part of the water obtained by the United States. This amount of SJC water closes the gap by 17 percent.

8-C.2.4 Santa Fe Area Subregion (Caja Del Rio-Santa Fe River and North Galisteo Creek Sub-basins)

The projected water supply-demand gap in the 2003 RWP for the Santa Fe Area Subregion was 19,200 acre-feet by 2060. The overall gap in 2060 is currently estimated to be 11,575 acre-feet. The reduction in the gap of 42 percent was achieved primarily through water conservation, transfer of agricultural water rights, and a revised population projection.

8-C.2.4.1 Santa Fe Area Subregion: Growth Correction

Population is not growing at the rate predicted in 2003. From 2000 to 2010, the population increased by 13,232 people, whereas the Jemez y Sangre 2003 RWP predicted an increase of 19,287 people over this time period. This difference of 6,055 people translates to approximately 1,108 acre-feet of water demand, thus reducing the gap by 6 percent. If the future population in 2060 is also 31 percent lower than predicted, the supply-demand gap could be reduced by 31 percent.

8-C.2.4.2 Santa Fe Area Subregion: Conservation

Per capita demand for public water systems in the Santa Fe Area sub region averaged 84 gpcd in 2010 (Lewis et al., 2013) and was 138 gpcd in 2000, which effectively decreases the projected gap in 2060 by 6,034 acre-feet or 30 percent.

8-C.2.4.3 Santa Fe Area Subregion: Domestic Wells

New domestic wells are allowed in areas located more than 300 feet from the City of Santa Fe water system (City of Santa Fe, 2016) and varying distances from the Santa Fe County water system for new developments (SFC, 2013). However, outside a municipality, on lots in some

older subdivisions and on lots that are not a part of a subdivision, a property owner can drill a well even if a public water system can provide service to the property. While greater depletions from groundwater are not desirable in many areas, new domestic wells are legal and are likely to continue to increase the stress on aquifers unless state law is changed to better protect senior water rights and to disallow domestic wells whenever connection to a public water system is a reasonable option. A total of 691 new domestic wells were permitted between 2000 and 2010. Assuming a domestic well diversion rate of 0.23 ac-ft/yr (2.3 people per house times 0.10 ac-ft/yr [Lewis et al., 2013]), an increase in diversion of 159 acre-feet has occurred, representing 1 percent of the projected supply-demand gap.

8-C.2.4.4 Santa Fe Area Subregion: Transfer Agricultural Water Rights Above Otowi Gage to Municipal Use below Otowi Gage

In order to meet 50 percent of the projected supply-demand gap in the Santa Fe Subregion, approximately 7,700 acres of agricultural land, or 38 percent of the irrigated land in the above the Otowi Gage, would have to be retired. No transfers have occurred to date (Section 8-C.1.3).

8-C.2.4.5 Santa Fe Area Subregion: Transfer Agricultural Water Rights Below Otowi Gage to Municipal Use Below Otowi Gage

To meet 50 percent of the projected supply-demand gap in 2060, 3,200 acres of land in the MRGCD would have to be retired. The total water rights transferred since 2000 is about 1,100 acre-feet, closing the gap by 5 percent (Erdmann, 2016).

8-C.2.4.6 Santa Fe Area Subregion: Utilize San Juan-Chama Project Water

SJC water has been put to beneficial use by the City of Santa Fe since 1978, primarily to offset impacts of pumping the Buckman wells on the flow in the Rio Grande as calculated by groundwater models. The calculated amount of impact to the Rio Grande generally increases when pumping increases and decreases when groundwater pumping is reduced. The impact of a single year's groundwater pumping, and the need to address those impacts through offset rights, continues for many years. In 2011, the City of Santa Fe and Santa Fe County completed the Buckman Direct Diversion Project to divert the 5,605-ac-ft/yr allocation of SJC water directly from the Rio Grande to allow water levels in the Buckman wells to recover in order to reduce environmental and operational costs and to protect regional groundwater for future use.

Estimation of the impact of the Buckman Direct Diversion on the supply-demand gap projected in 2003 requires examination of the past, current, and future use of SJC water. As of 2003, when the gap was calculated for the 2003 Jemez y Sangre RWP, approximately 2,500 ac-ft/yr of the City and County of Santa Fe's SJC allocation of 5,605 ac-ft/yr was being used to offset the impacts of pumping from the City of Santa Fe Buckman well field at a rate of about 5,000 ac-ft/yr. A portion of the SJC water (average of 403 ac-ft/yr, from 1978 to 2002) was also used in an exchange for post-Compact storage in McClure Reservoir on the Santa Fe River.

With the City's allocation of SJC water being diverted at the Buckman Direct Diversion and unavailable for use to offset the pumping impacts of the Buckman well field, the wells could not continue to be pumped at historical levels. In order to continue to utilize the Buckman well field as a backup supply in the event of reduced surface water availability, additional water rights need to be transferred to offset the impacts to the Rio Grande and its tributaries. Thus, the actions to date under the "utilize San Juan-Chama Project water" alternative have not closed the gap between supply and demand directly. The Buckman Direct Diversion Project, completed in 2011, increased the overall capacity of the water system by an amount equal to the full annual SJC allocation less the portion that had been historically used to offset Buckman well field pumping. Additionally, by resting the aquifers during times when the surface water supply was available, groundwater levels have recovered significantly. The City expanded the Buckman well field (wells 10 through 13) in 2002, and an additional 1,100 acre-feet of native Rio Grande water rights have been transferred to the wells, closing the supply-demand gap by about 5 percent.

Future options for closing the supply-demand gap with the Buckman Direct Diversion involve the use of return flow credits, a strategy included in the 2003 Jemez y Sangre plan. In the Santa Fe Subregion 4,000 ac-ft/yr of additional water could be obtained if the City of Santa Fe pursued enough return flow credits to fully consume the SJC water through an exchange with treated effluent. Options for obtaining return flow credits are currently being evaluated by the City, working with the Bureau of Reclamation, as part of a feasibility study being conducted for potential wastewater reuse.

Through multi-party negotiations, the City of Santa Fe also managed to exchange water in Elephant Butte Reservoir for water at the top of the Rio Chama reservoir system. The City presently holds over 15,000 acre-feet of SJC water in those reservoirs, in addition to its annual SJC allocation.

The total amount of water that could be gained by pursuing a direct diversion project that allows additional depletions through return flow credits of the Santa Fe SJC water (estimated at 4,000 acre-feet) and a lease of about 4,000 acre-feet of Jicarilla Apache SJC water (and return flow credits of 2,000 acre-feet) was estimated at about 10,000 ac-ft/yr, or 50 percent of the Jemez y Sangre 2003 projected gap between supply and demand in 2060.

8-C.2.5 South Galisteo Creek Sub-Basin

The water demand-supply gap by 2060 in the South Galisteo Creek Sub-Basin was estimated in the 2003 RWP to be 1,856 acre-feet. The revised gap in 2060 is estimated to be 1,619 acre-feet as summarized below. Few options to reduce the gap were considered to be available in 2003 due to the low density of population and limited resources. The most promising were considered to be conservation, growth management, and domestic wells. The 2003 plan did not include the

extension of the Eldorado Area Water & Sanitation District water lines into the South Galisteo Creek Sub-basin, which has since occurred (Section 8-C.6.4).

8-C.2.5.1 South Galisteo Creek Sub-Basin: Growth Correction

Population is not growing at the rate predicted in the 2003 Jemez y Sangre RWP. From 2000 to 2010, the population increased by 2,579 people, whereas the 2003 plan predicted an increase of 2,608 people over this time period. This difference of 1,029 people represents approximately 154 acre-feet of reduced water demand, thus reducing the gap by 8 percent.

8-C.2.5.2 South Galisteo Creek Sub-Basin: Conservation

Per capita demand for public water systems has declined from 119 to 99 gpcd in the South Galisteo Creek Sub-Basin (Lewis et al., 2013), thus reducing the gap by 14 acre-feet, or 1% of the gap in 2060.

8-C.2.5.3 South Galisteo Creek Sub-Basin: Domestic Wells

Since 2000, an estimated 213 domestic wells have been drilled in the South Galisteo Subregion. With the average household size of 2.17 and a per capita rate of 0.15 ac-ft/yr (134 gpcd), the diversions from these new wells total 69 acre-feet, or about 4 percent of the gap.

8-C.2.5.4 South Galisteo Creek Sub-Basin -Extension of Eldorado Area Water & Sanitation District

Between 2000 and 2007, the Eldorado Area Water & Sanitation District connected two subdivisions with 30 parcels total within the South Galisteo Sub-basin and approved an agreement for one additional subdivision with 38 parcels.

8-C.3 Summary of Reduction in Water Supply-Demand Gap

In summary, the projected gap between supply and demand in 2060 has decreased significantly:

- Growth management (or growth correction) reduced the demand gap by 2,400 acre-feet per year, closing the gap by 7 percent. This reduction is only for the change in predicted growth for 2010 versus actual census population in 2010. Thus, if the population growth continues at the same reduced rate, the gap with be further reduced by 2060.

- The conservation savings achieved in just ten years was estimated to reduce the projected supply-demand gap in 2060 by 6,400 ac-ft/yr for the Jemez y Sangre region, closing the gap by 20 percent.

- An estimated 1,570 new domestic wells increased the water provided by over 500 acre-feet, closing the gap by 2 percent.

- Transfers of 2,600 acre-feet of water rights from agriculture to non-agricultural uses closed the gap by 8 percent.
- San Juan-Chama Project Water and Nambe Pueblo reserved rights applied to the Aamodt settlement reduces the sup-demand gap by almost 1,400 ac-ft/yr, or about 4 percent.

The total reduction of 13,300 acre-feet in the projected gap in 2060 represents 41 percent of the gap projected in the 2003 RWP.

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