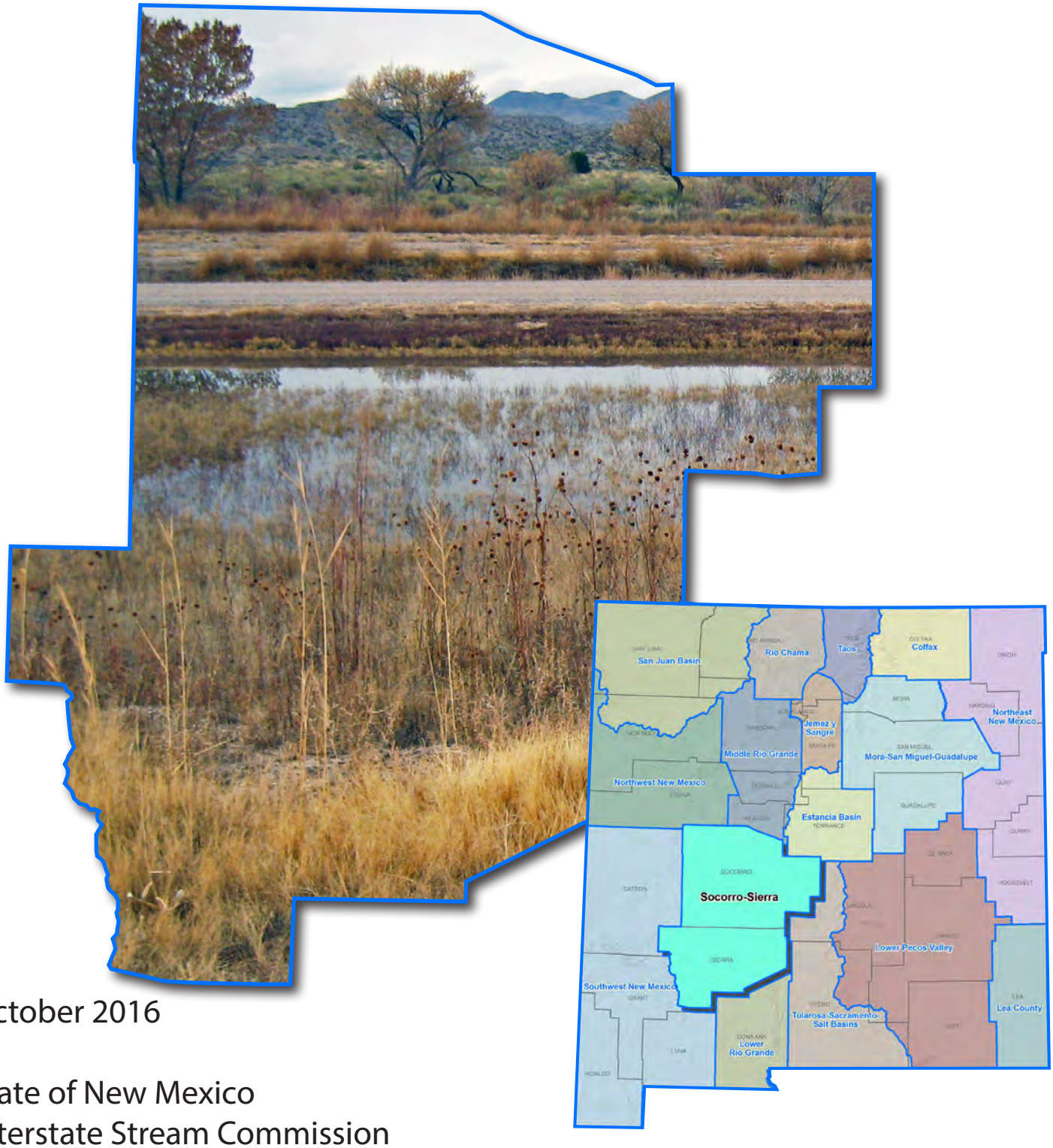
Socorro-Sierra Regional Water Plan



October 2016

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

Cover photograph: Bosque del Apache

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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
BLM	Bureau of Land Management
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CID	Carlsbad Irrigation District
CWA	Clean Water Act
DBS&A	Daniel B. Stephens & Associates, Inc.
DWS	Domestic Well Statute
EPCWID	El Paso County Water Improvement District
EBID	Elephant Butte Irrigation District
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
ft amsl	feet above mean sea level
FY	fiscal year
GIS	geographic information system
gpcd	gallons per capita per day
GWQB	Ground Water Quality Bureau [New Mexico Environment Department]
IBWC	International Boundary and Water Commission
ICIP	Infrastructure Capital Improvement Plan
IPCC	Intergovernmental Panel on Climate Change
LFCC	Low Flow Conveyance Channel
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
MDWA	mutual domestic water association
MDWCA	mutual domestic water consumers association
MRGCD	Middle Rio Grande Conservancy District
NASS	National Agricultural Statistics Service

NCDC	National Climatic Data Center
NEPA	National Environmental Policy Act
NMAC	New Mexico Administrative Code
NMBGMR	New Mexico Bureau of Geology & Mineral Resources
NMED	New Mexico Environment Department
NMELC	New Mexico Environmental Law Center
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
NRCS	Natural Resources Conservation Service
NWS	National Weather Service
PCB	polychlorinated biphenyl
PDNWC	Paso del Norte Watershed Council
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
SNOTEL	snowpack telemetry
SSPA	S.S. Papadopulos & Associates, Inc.
SWCD	soil and water conservation district
TMDL	total maximum daily load
U.S. EPA	U.S. Environmental Protection Agency
USBR	U.S. Bureau of Reclamation
USDA	U.S. Department of Agriculture
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

WEG	WildEarth Guardians
WQA	Water Quality Act (New Mexico)
WRCC	Western Regional Climate Center

Executive Summary

The Socorro-Sierra Water Planning Region, which includes Socorro and Sierra counties (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 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 Socorro-Sierra Regional Water Plan was completed and accepted by the NMISC in 2003.

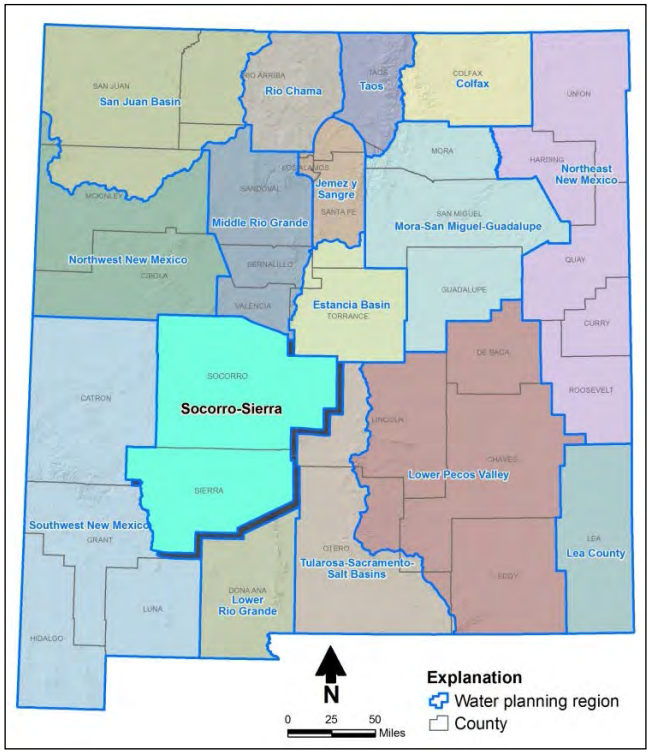


Figure ES-1. Socorro-Sierra Water Planning Region

The purpose of this document is to provide new and changed information related to water planning in the Socorro-Sierra 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, this regional water plan (RWP) update summarizes key information in the 2003 plan 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, 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. Because of its reliance on surface water, the region has a high degree of vulnerability to drought, and the estimated shortage in drought years is expected to range from 143,902 to 169,625 acre-feet (Figure ES-3). Strategies that the region identified to address potential water shortages and water management challenges include increasing the understanding of surface water and groundwater interaction in certain river reaches, evaluating and improving surface water delivery infrastructure, ongoing implementation of agricultural conservation and best management practices, and implementing water system infrastructure maintenance and upgrades. Watershed, stream system, and wildlife habitat restoration are also important strategies to be implemented throughout the region.

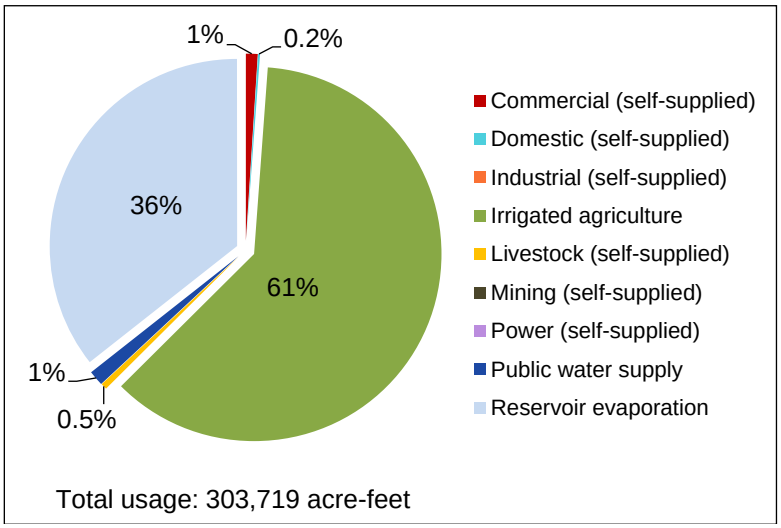


Figure ES-2. Total Regional Water Demand, 2010

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.

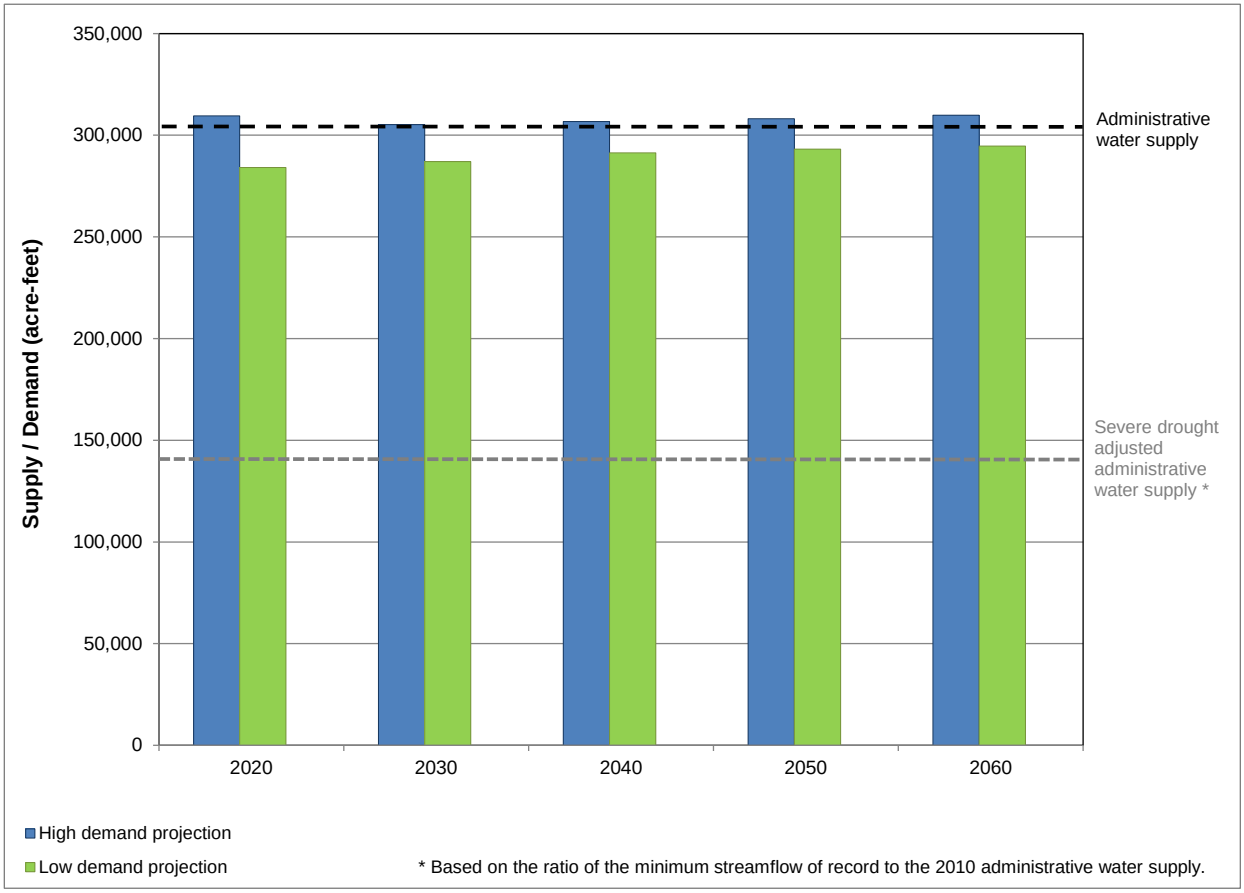


Figure ES-3. Available Supply and Projected Demand

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.

Planning Method

For this 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. 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:

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.

- 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.

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 Socorro-Sierra 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 Socorro-Sierra region include the following:

- Because the region relies heavily on surface water, drought is a major concern. For New Mexico Climate Division 5, which covers a large portion of the planning region, 2011, 2012, and 2013 were all severe to extreme drought years, and the winter snowpack for 2014 was also very low. This is a particular concern for agricultural users that are dependent on surface water; therefore drought preparedness (developing drought contingency plans and shortage sharing agreements) is important for each community and irrigation system in the region.

- The Rio Grande is the main river in the planning region. As it flows through Socorro and Sierra counties, the river struggles to maintain a geomorphic equilibrium. Large quantities of sediment are contributed to the river system from the Rio Puerco and Rio Salado in the northern part of the region as well as from numerous smaller ungaged tributaries throughout the length of the river in the region. The overall geomorphic and hydrologic conditions of the Rio Grande within the region make water delivery and management activities difficult.

- Much of the groundwater in the region is within the Rio Grande Underground Water Basin and is considered to be stream-connected. The Rio Grande is considered to be fully appropriated, and any new water uses that impact the flows of the Rio Grande must be offset through return flow, the transfer of water rights, and/or supplementation by a new source of water. The availability of water rights may thus be a limiting factor in meeting the future water needs of the region. No mechanism is presently in place in the southern portion of the planning region to allow transfers of Rio Grande Project water from the Elephant Butte Irrigation District (EBID) to non-agricultural uses.

- In 2013 the State of Texas initiated a lawsuit in the U. S. Supreme Court over the Rio Grande Compact, specifically water management and water use by New Mexico below Elephant Butte Dam, and names New Mexico and Colorado as defendants. The United States has joined in this lawsuit. The outcome of this lawsuit, whether through settlement or court order, may have significant impacts on water management in the region.

Rio Grande Compact

Signed in 1938, with Colorado, New Mexico, and Texas as parties, and approved by Congress in 1939, the Rio Grande Compact apportions the surface waters of the Rio Grande 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 affects water planning in New Mexico in two primary ways:

- The Compact requires that a proportion of the water that enters the Middle Rio Grande valley must be delivered to Elephant Butte Reservoir. This requirement limits depletions in the 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.

- Water users throughout the Middle Rio Grande area, such as municipalities, that are seeking to obtain water rights to meet growing demands are challenged because they must acquire an existing senior water right. No new appropriations are available in the region. After the groundwater basin was closed to new appropriations in 1956, a number of entities applied for and were issued groundwater pumping permits with the condition that the effects of the pumping on the river would be offset when they occur. Municipal return flow, San Juan-Chama Project water, and the transfer of senior water rights are used as offsets as required by the specific permit requirements, with return flows comprising the greatest volume of offset. When the effects on the river are fully realized, the amount of senior water rights needed to offset the pumping under these permits is roughly equal to all of the transferrable senior water rights from the irrigated land along the Rio Grande from north of Albuquerque to Elephant Butte.

- A new Operating Agreement for the Rio Grande Project, a portion of which is located in the Socorro-Sierra region, developed during settlement of litigation between EBID, El Paso County Water Improvement District Number One (EPCWID #1), and the U.S. Bureau of Reclamation (USBR) in Texas Federal District Court, was implemented in 2008. Implementation of this agreement appears to have reduced EBID's allocation of Rio Grande Project water in full-supply years by more than 150,000 acre-feet, and this large decrease is likely to lead to increased dependence on groundwater for irrigation. Many questions persist regarding the fairness and sustainability of the Operating Agreement as it has been implemented. The New Mexico Attorney General sued the USBR in 2011 regarding this Operating Agreement, but the judge in the case has stayed

any action in this lawsuit pending action by the U. S. Supreme Court in the Rio Grande Compact litigation. Continued conflict associated with this Agreement is likely.

- Water use below the Otowi gage is restricted by the Rio Grande Compact based on the Otowi Index Supply, and therefore the supplies of the Jemez y Sangre, Middle Rio Grande, and Socorro-Sierra planning regions are linked. Furthermore, the majority of water entering the region along the Rio Grande is required to be delivered to Elephant Butte Reservoir.

- Augustin Plains Ranch LLC applied to the NMOSE for a permit to pump 54,000 acre-feet of groundwater in October 2007. The State Engineer denied both the original and an amended application and the denial was affirmed in November 2014 by the District Court. On September 7, 2016, Augustin Plains Ranch published notice that it had filed a corrected application numbered RG-89943 for a Permit to Appropriate Groundwater in the Rio Grande Underground Water Basin of the State of New Mexico. Protests to the original application are considered valid for the corrected application, but additional protests are expected.

- The Village of Magdalena could not produce water from their only well for most of June 2013 and had to resort to water hauling. In response, older wells were rehabilitated, and the newer well gradually recovered. To better understand the groundwater resources in the area, the New Mexico Bureau of Geology and Mineral Resources Aquifer Mapping Program assessed hydrogeologic information and measured water levels in 37 wells. This study indicated that most of the wells produce only small amounts of water and that the few wells that have higher yields are located near the Magdalena Fault.

- There are 46 mostly small rural drinking water systems within the region. Though the source water for these systems is generally good-quality groundwater, the maintenance, upgrades, training, operation, and monitoring that are required to ensure delivery of water that meets drinking water quality standards is a financial and logistical challenge for these small systems.

- The Federal Emergency Management Administration recently released new floodplain maps of Socorro and Sierra counties. The new maps define hazard areas and indicate flood insurance rate boundaries.

- Most of the water in the region is used for irrigated agriculture, and the Middle Rio Grande Conservancy District (MRGCD) is the largest user. The MRGCD has four major river diversion points, one of which is within the Socorro-Sierra region, and a large network of irrigation canals in the area between Cochiti and the Bosque del Apache National Wildlife Refuge. Additionally, passive diversion by MRGCD occurs from the river to the adjacent riverside drains. MRGCD has storage rights in El Vado Reservoir

that it can use when native flow is insufficient to meet MRGCD irrigation demand. Providing sufficient deliveries for agricultural users during multi-year droughts is an important issue in the region.

- The MRGCD has not yet submitted documentation regarding the water that it has put to beneficial use since its permit was issued in 1930. Without such documentation and a thorough evaluation of the documentation by the State Engineer, the nature and extent of the rights under the 1930 permit will remain unclear.

- Endangered species and environmental restoration issues may increase in importance. Large populations of southwestern willow flycatcher and yellow billed cuckoo, both federally listed species under the Endangered Species Act, reside in the dry portion of the reservoir pool of Elephant Butte Reservoir. The USBR is currently conducting an Environmental Impact Statement on the 2008 Operating Agreement. Consultation will be required with the U.S. Fish and Wildlife Service over operations of Elephant Butte and Caballo reservoirs in regard to both species. The outcome of the consultation is unknown but could have an effect on Rio Grande Project operations. Furthermore, a number of non-government organizations have taken a keen interest in the potential for aquatic and related wetland restoration in and along the main channel of the Rio Grande within the EBID and Lower Rio Grande basin.

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 strategies was first completed.

The 2003 Socorro-Sierra Regional Water Plan recommended the following strategies for meeting future water demand:

- Improve the efficiency of surface water irrigation conveyance systems
  - Gage all diversions from the Low Flow Conveyance Channel (LFCC) to irrigation systems
  - Evaluate canal seepage losses.
  - Evaluate abandonment of the Socorro Ditch inside the City of Socorro
  - Evaluate lining or piping reaches of major canals with significant seepage and/or few irrigators
  - Determine the feasibility of implementing rotational scheduling
- Improve on-farm efficiency

- Control brush and weeds along water distribution systems and drains
- Control non-reservoir surface water evaporation by reducing surface water in engineered and natural locations (LFCC)
- Require proof of sustainable water supply for approval of new developments
- Encourage retention of water within the planning region
- Remove exotic vegetation (i.e., salt cedar, Russian olive) on a wide scale
- Manage watersheds to increase yield and improve water quality

The steering committee reviewed each of the strategies and indicated that, with the exception of abandonment of the Socorro Ditch, they are all still relevant, though some are being refocused as new recommended strategies.

During the two-year update process the Socorro-Sierra 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 an inclusive table of all of the PPPs that regional stakeholders are interested in pursuing. In the Socorro-Sierra 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 sub-regional 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 Socorro-Sierra region stakeholders:

- *Surface and groundwater interaction and aquifer mapping*. This effort focuses on improving understanding of groundwater and surface water interactions for key river reaches and acequias. Additionally, data from weather stations in certain areas are needed to understand local precipitation. This information coupled with further decision tool development will assist in evaluating different areas of vulnerability and identifying potential improvements. The initial focus will be on the San Acacia reach where some preliminary components have been developed.
- *Water resource data sharing.* This strategy relates to all implementation strategies. As planning initiatives are implemented, water managers and stakeholders in the region should have ready access to the completed studies and implementation outcomes. This

project specifically focuses on facilitating information sharing through a common website and ongoing meetings, as well as developing a region-specific geodatabase.

- *Agricultural conservation and best management practices*. Continue to implement strategies identified in the 2003 RWP, particularly within the Middle Rio Grande Conservancy District and independent acequias.

- *Watershed, stream system and wildlife habitat restoration and improvements.* This strategy focuses on different needs within the river systems such as riparian wildlife habitat availability, which is affected by interactions between the physical processes on the Rio Grande and its tributaries and the plants and animals that live in reaches of the river located within the planning region. Developing and using data to help prioritize and develop techniques to evaluate current and potential future riparian ecosystem strength and sustainability are needed. Development of an ecological model will contribute to the decision support tool for the region.

- *Encourage low water use industry as part of economic development.* To implement this strategy, which has statewide applicability, water managers and economic development agencies need to identify opportunities for low water use industry in the region. Once this information is better understood and successful models and case studies have been developed, specific implementation initiatives can be identified for this region. This information should be integrated with other planning activities.

- *Surface water delivery infrastructure evaluation.* Evaluate aging infrastructure to identify impacts to current water uses and opportunities for redesign to help meet future demand. Includes conveyance efficiency, sedimentation changes, effects of water loss or gain, and impacts to water quality from changes in water delivery.

- *Water system infrastructure maintenance and upgrades.* Multiple system-specific projects to address water system maintenance and infrastructure needs to meet future demand have been identified by water providers in the region. These projects include: expansion or installation of additional water lines, increased capacity for fire flow, sewer system installation and upgrade, drilling of new wells, installation of meters, and development of system-specific planning documents and tools such as preliminary engineering reports, which are required as a first step toward implementation.

The 2016 Regional Water Plan 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 Socorro-Sierra Water Planning Region, which includes all of Socorro and Sierra counties (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 *Socorro-Sierra Regional Water Plan* was completed and accepted by NMISC in 2003 (DBS&A, 2003).

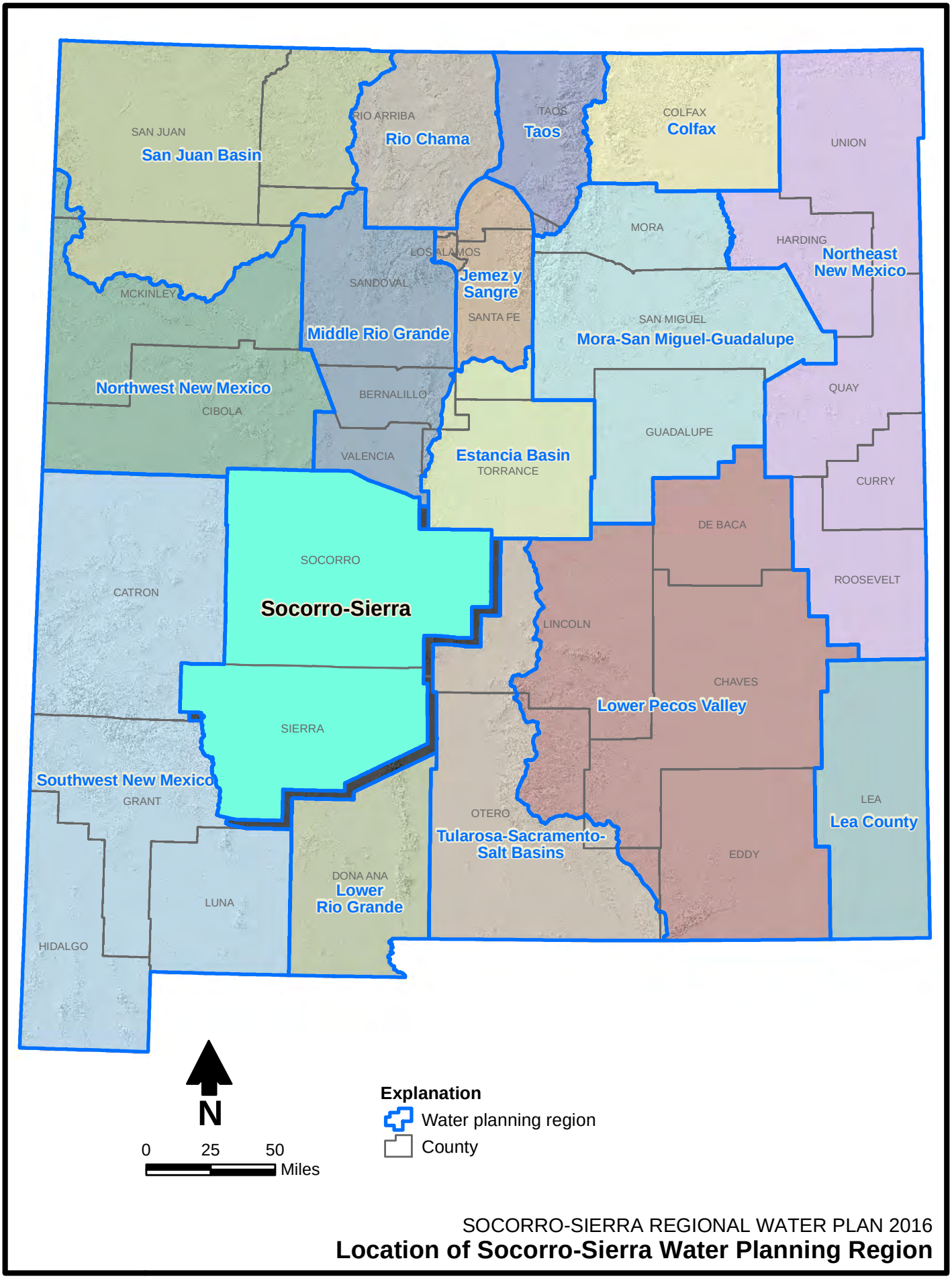
The purpose of this document is to provide new and changed information related to water planning in the Socorro-Sierra region, as listed in the bullets below, and to evaluate projections of future water supply and demand for the region using a common technical approach applied to all 16 planning regions statewide. Accordingly, the following sections summarize key information in the 2003 plan 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 Socorro-Sierra 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 strategies that will help to balance supplies and projected demands and address the Socorro-Sierra 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.

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.



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SOCORRO-SIERRA REGIONAL WATER PLAN 2016

Location of Socorro-Sierra Water Planning Region

Figure 1-1

- Section 3 provides background information regarding the characteristics of the Socorro-Sierra 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; key information from that plan is summarized in Section 5, with new information that has become available since 2003 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.
- 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. 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.

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.*

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 the amount of water withdrawals in 2010 as outlined in the *New Mexico Water Use by Categories 2010* report.
- *Water demand* is based on 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 the1990s 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 Socorro Sierra 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 *Socorro Sierra 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].)

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 Socorro-Sierra 2016 regional water plan.

2.2 Public Involvement in the Socorro-Sierra 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 identified and asked to participate through interviews, public meetings, recommendations, and outreach to specific interests. Through this outreach, the Socorro-Sierra Water Planning Region established a representative steering committee, the members of which are listed in Table 2-1.

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 Merry Jo Fahl, Sierra Soil and Water Conservation District (SWCD) and Nyleen Troxel Stowe, Socorro SWCD as the key contacts for the committee. The steering committee discussed the value of developing subcommittees and determined that it would not be feasible to develop subcommittees.

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. Steering committee members were also 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.

To maximize public involvement the steering committee recommended that meetings alternate between Socorro and Sierra counties and be held in the afternoon.

Over the two-year update process, seven meetings were held in the Socorro-Sierra region. A summary of each of the meetings is provided in Table 2-2.

Table 2-1. Steering Committee Members, Socorro-Sierra Water Planning Region

Page 1 of 2

Water User Group	Name	Organization / Representation
Agricultural – groundwater user (recommended as technical support to the region)	David Gensler	Middle Rio Grande Conservancy District (MRGCD) hydrologist
Agricultural – surface water user	Lon Monroe	Monticello Community Ditch
Agricultural – surface water user (recommended as technical support to the region)	David Gensler	MRGCD hydrologist
County government	Delilah Walsh, County Manager	Socorro County
	Bruce Swingle, County Manager	Sierra County
	Sherrie Fletcher	Sierra County Commissioner
Environmental interest (recommended as technical support to the region)	John Cornell	New Mexico Wildlife Federation
Environmental interest	Dan Lorimer	Sierra Club
	Leroy Henderson	Cuchillo Community Action Committee Organic Farmer
Extractive industry	Katie Emmer	New Mexico Copper Corp.
Federal agency (technical support to the region)	Kevin Cobble, Refuge Manager	Bosque del Apache
	Bill Childress	BLM – Las Cruces
	Adrian Tafoya	USDA - NRCS
	Larry Cosper Chris Adams (Alternate)	USFS – Black Range District
	Brent Tanzy	US Bureau of Reclamation
	Kelly Norwood	White Sands Missile Range
State agency (technical support to the region)	Saul Barrera	Caballo Lake State Park
	Kay Dunlap	Elephant Butte State Park
	Chad Rabon	NM Spaceport Authority
	Chris Canavan	NMED Surface Water Quality Bureau
	Doug Boykin	NM Dept. of State Forestry
Local (retail) business	Kathy Clark	Hot Springs Bath House Association
	Sherry Fletcher	Campo Espinoso
Local (retail) business/State Legislature	Don Tripp	NM State Representative Business Owner

Table 2-1. Steering Committee Members, Socorro-Sierra Water Planning Region

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Water User Group	Name	Organization / Representation
Municipal government	Dean Banks	City of Elephant Butte
	Debbie Stubblefield, Mayor Maggie Powey (alternate)	Village of Williamsburg
	Mayor Bhasker Terry Tadano (Alternate) Suzanne Smith (Alternate)	City of Socorro
	Diego Montoya, Mayor	City of Magdalena
	Juan Fuentes, City Manager	Truth or Consequences
Rural water provider	Claudia Jeffery	Monticello Mutual Domestic Water Users Association
	Richard Anderson	San Antonio Mutual Domestic Water Users Association
Tribal (recommended as technical support to the region)	Inez Iapachito	Alamo Navajo Chapter
Watershed interest	Gina Dello Russo	Retired, Bosque del Apache
	Max Yeh	Percha/Animas Watershed Association
	Nyleen Troxel-Stowe, Executive Director	Socorro County SWCD
	Merry Jo Fahl, Executive Director Crystal Diamond (alternate)	Sierra County SWCD

Table 2-2. Socorro-Sierra Region Public Meetings

Page 1 of 3

Date	Location	Purpose	Meeting Summary
FY 2014			
5/21/2014	Albert Lyons Event Center, Truth or Consequences, New Mexico	Kickoff meeting: Present the regional water planning update process to 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			
10/28/2014	Albert Lyons Event Center, Truth or Consequences, New Mexico	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.
4/28/2015	Albert Lyons Event Center, Truth or Consequences, New Mexico	Review the update process and the timeline for completing the regional water plan (RWP)update.	The group discussed new information from the region and/or the projects, policies, programs (PPPs) that had been implemented since the 2003 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. A date was set for the next meeting and a summary of the discussion was sent to the master stakeholder list with information about the next meeting including agenda items and location, date and time, and next steps.

Table 2-2. Socorro-Sierra Region Public Meetings
Page 2 of 3

Date	Location	Purpose	Meeting Summary
5/27/2015	New Mexico Bureau of Geology and Mineral Resources Building, Socorro, New Mexico	Review projects completed since submission of the accepted plan and provide additional input. Discuss potential collaborative projects.	The group reviewed projects completed since submission of the accepted plan and provided additional input. The group further discussed potential collaborative projects such as water system regionalization/cooperation, monitoring/data collection, watershed restoration, coordinating flood response, local and state water policy recommendations, and water quality protection.
FY 2016			
3/9/2016	New Mexico Bureau of Geology and Mineral Resources Building, Socorro, New Mexico	Review steering committee membership and leadership. Focus on the PPPs to be included in the update and the process for submitting comments to the draft RWP.	The group reviewed the steering committee membership and suggested additional members to fill vacancies. The group discussed the public comment period and agreed to open up the plan for public comment in May using a press release to announce that process. The steering committee and interested stakeholders present participated in a brainstorming activity that helped to identify regional projects that held the potential for the greatest collaboration and effort. The consultants affirmed the next steps for the RWP update effort and scheduled the next meeting for April 11, 2016 at 1:00 p.m.
4/11/2016	City of Truth or Consequences Chamber of Commerce, Truth or Consequences, New Mexico	Refine the key collaborative PPP recommendations specific to Section 8.	The group discussed comments that had already been received regarding the Plan. The group identified a number of projects that would potentially have greater interest and benefit to multiple stakeholders, and discussed and identified key program and policy recommendations. The final meeting was scheduled for June 8, 2016.

Table 2-2. Socorro-Sierra Region Public Meetings
Page 3 of 3

Date	Location	Purpose	Meeting Summary
6/8/2016	New Mexico Bureau of Geology and Mineral Resources Building, Socorro, New Mexico	Review the Public Involvement section (2) and the Section 8 key strategies and PPP list.	The steering committee reviewed the updated drafts of Sections 2 and 8 as well as the single comment document. Final edits will be incorporated prior to submission of these sections to the NMISC on June 30.

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

The steering committee recognized that future water planning efforts would require additional funding and support to ensure ongoing participation. Meetings should continue to be held in each of the two counties in the region, and additional outreach to the small water systems and acequias, as well as other stakeholders, will be needed to ensure participation.

3. Description of the Planning Region

This section provides a general overview of the Socorro-Sierra 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 Socorro-Sierra Water Planning Region is located in central New Mexico. The region is bounded on the north by the Northwest New Mexico, Middle Rio Grande and Estancia Planning Regions (Cibola, Valencia, and Torrance counties), on the west by the Southwest New Mexico Planning Region (Catron and Grant counties), on the south by the Southwest New Mexico and Lower Rio Grande Planning Regions (Luna and Doña Ana counties), and on the east by the Tularosa-Sacramento-Salt Basin Planning Region (Lincoln and Otero counties) (Figure 1-1). Elevations range from over 10,000 feet above mean sea level (ft amsl) in the mountainous areas of the region to about 4,100 ft amsl in the southern portion (Figure 3-1).

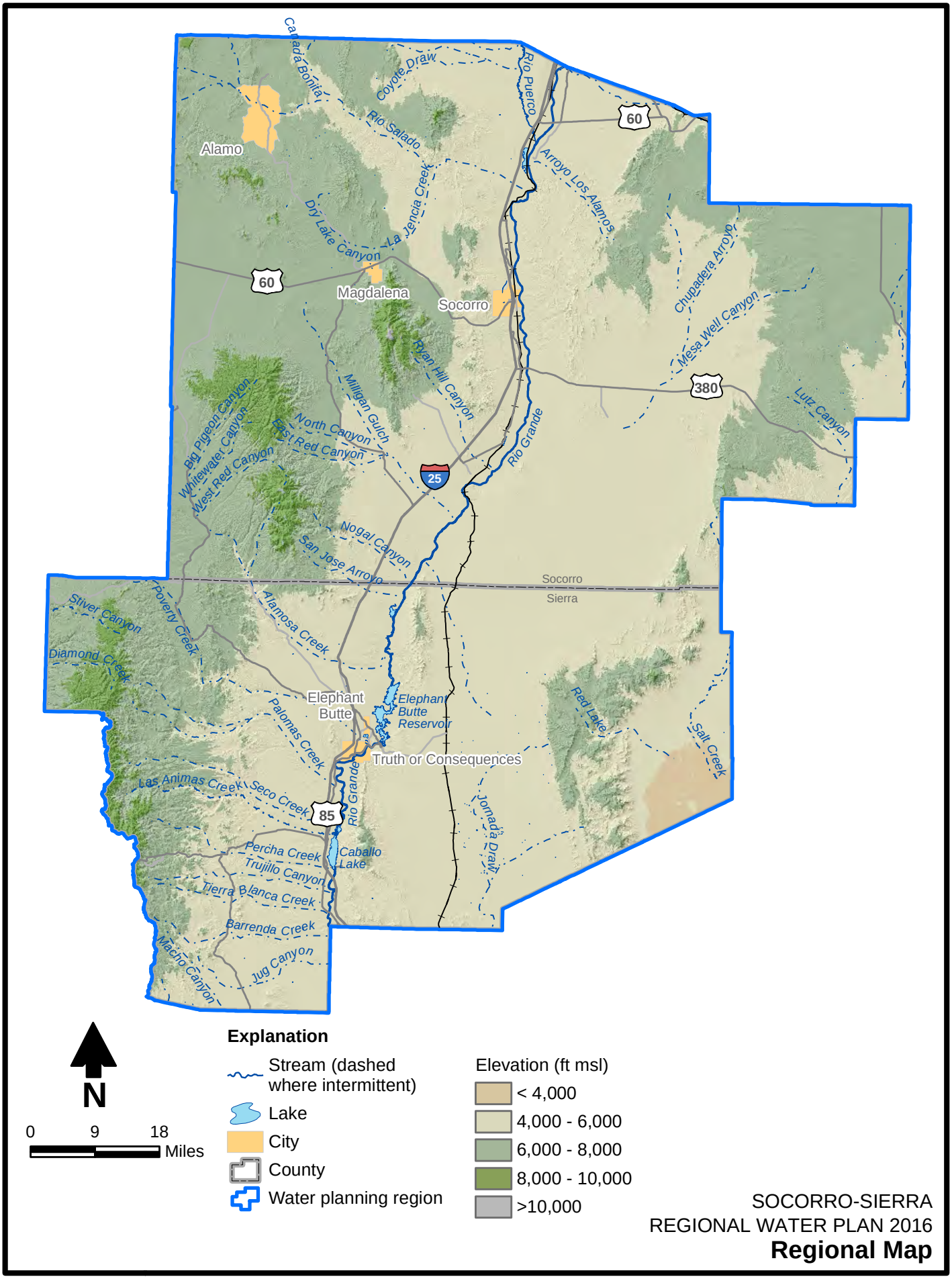
The total area of the planning region is approximately 10,886 square miles, distributed among the two counties as follows:

- Socorro: 6,649 square miles
- Sierra: 4,237 square miles

Natural resources in the Socorro-Sierra region include some small sand and gravel and perlite mines, and some forested uplands in the higher elevation portion of the region.

3.2 Climate

The varied terrain of Socorro and Sierra counties, which ranges from mountains to foothills to plains and valleys, results in significant climate variations. For example, temperatures range from lows that are well below 0 degrees Fahrenheit (°F) in the mountains to highs in excess of



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REGIONAL WATER PLAN 2016

Regional Map

Figure 3-1

100°F in the valley. The average temperature in the planning region ranges between 50 and 60°F.

Precipitation also varies across the planning region, influenced by location and somewhat by elevation. Weather systems may enter the planning region from the west (Pacific), northeast (Arctic air masses from the plains), and southwest (Gulf of Mexico), and systems from each point of origin bring unique sets of temperatures and moisture to the planning region. Average annual precipitation ranges from about 8 to 18 inches. The majority of the precipitation occurs as monsoons during the months of July through September.

3.3 Major Surface Water and Groundwater Sources

Socorro and Sierra counties lie almost entirely within the Rio Grande Basin. A small area in northwest Sierra County lies within the Gila River Basin. The main tributaries to the Rio Grande within the planning region are the Rio Salado and the Rio Puerco, both of which enter the Rio Grande from the northwest. A number of smaller tributaries, including Alamosa Creek, Las Animas Creek, Percha Creek and others flow into the Rio Grande from the west in the southern part of the region (Figure 3-1). The only one of these tributaries that has more than 10 years of streamflow data is Alamosa Creek. Elephant Butte and Caballo reservoirs are located in Sierra County, within the southernmost part of the planning region. These two reservoirs and the irrigated lands below Caballo Reservoir are part of the Rio Grande Project, which was authorized by the Secretary of the Interior in 1905 under the provisions of the Reclamation Act. The Rio Grande Project provides irrigation, drainage, and flood control benefits to about 178,000 acres of river bottom lands in the Rio Grande Valley in south-central New Mexico and west Texas.

The occurrence of groundwater in the planning region is controlled by the varying hydrogeologic conditions of the two physiographic provinces: Datil Section of the Colorado Plateau and the Mexican Highland and Sacramento Sections of the Basin and Range Province. Hydrogeologic conditions are also dependent upon localized geologic structures, stratigraphy, and geologic formation lithologies. Groundwater basins that are present in the region include portions of eight NMOSE-declared underground water basins (UWBs) for the purpose of active management, with the majority of the region being located in the Rio Grande Basin. (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 basins are shared with the following water planning regions:

- Middle Rio Grande (Rio Grande)
- Estancia (Rio Grande, Tularosa)
- Southwest (Rio Grande, Gila-San Francisco, Las Animas Creek, Mimbres)
- Lower Rio Grande (Mimbres, Lower Rio Grande, and Nutt-Hockett)

- Tularosa Sacramento-Salt Basins (Tularosa)

A map showing the UWBs in the region is provided in Section 4.7.2.

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

3.4 Demographics, Economic Overview, and Land Use

The Socorro-Sierra Water Planning Region includes all of Socorro and Sierra counties. The 2013 populations of Socorro and Sierra counties were 17,584 and 11,572, respectively (U.S. Census Bureau, 2014a). Both counties are sparsely populated overall, with densities of 2.7 persons per square mile in Socorro County and 2.9 persons per square mile in Sierra County (U.S. Census Bureau, 2014a).

As shown in Table 3-1, between 2010 and 2013 the population of Socorro County declined by 282 people (1.6 percent) and the population of Sierra County dropped by 416 people (3.5 percent).

Agriculture is the predominant land use in the region. Tourism in the region centers around the Bosque del Apache National Wildlife Refuge south of Socorro, which provides important habitat for migratory birds, and Elephant Butte Reservoir, which brings tourists into the towns of Elephant Butte and Truth or Consequences.

The largest employment categories in Socorro County are education/healthcare, professional, scientific and management, and arts, entertainment, recreation, accommodation, and food services. The largest employment categories in Sierra County are education/healthcare, arts, entertainment, recreation, accommodation and food services, and retail trade.

While irrigated agriculture consumes the most water in Socorro County, reservoir evaporation consumes the most water in Sierra County. The reservoir is primarily for the benefit of water users outside of the region, but reservoir evaporation is tracked by NMOSE at the location of the reservoir.

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

- Federal agencies: 6,145 square miles
- Tribes: 236 square miles
- State agencies: 1,412 square miles
- Private entities: 3,093 square miles

Table 3-1. Summary of Demographic and Economic Statistics for the Socorro-Sierra Water Planning Region

a. Population

County	2000	2010	2013
Socorro	18,078	17,866	17,584
Sierra	13,270	11,988	11,572
Total Region	31,348	29,854	29,156

Source: U.S. Census Bureau, 2014a

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 (%)
Socorro	17,795	75	9,008	8,529	5.3
Sierra	16,734	70	5,876	5,510	6.2
Total Region	—	—	14,884	14,039	5.7

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

[b] NM Department of Workforce Solutions, 2014

c. Business Environment

County	Industry	Number Employed	Number of Businesses
	2008-2012 [a]		*2012*
Socorro	Education / healthcare	2,365	231
	Professional / scientific	619	
	Arts / entertainment / recreation / accommodation	601	
	Retail trade	575	
	Public Administration	418	
	Agriculture	301	
Sierra	Education / healthcare	884	221
	Arts / entertainment / recreation / accommodation	590	
	Retail trade	447	
	Agriculture	354	
	Public administration	327	

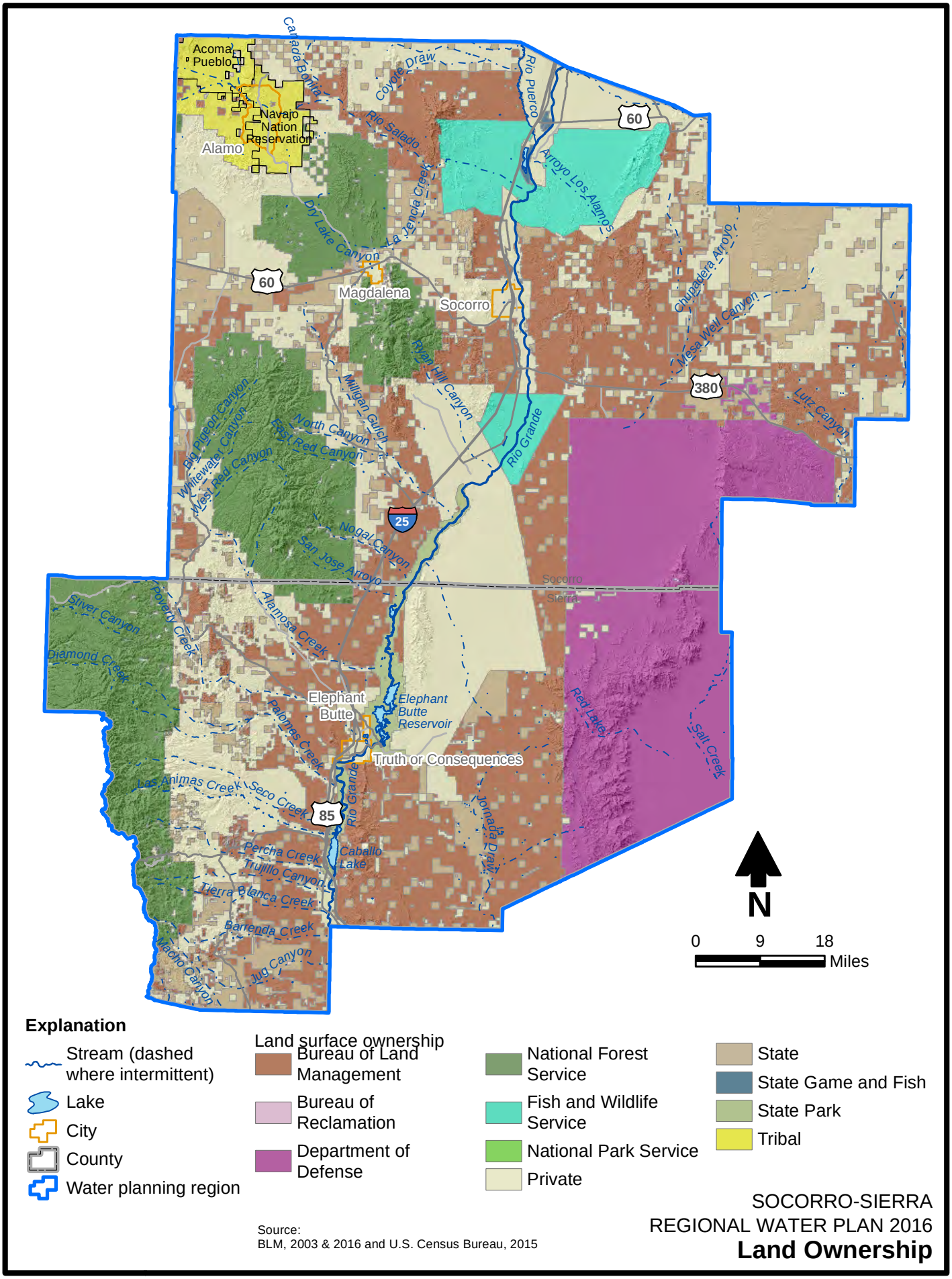
[a] U.S. Census Bureau, 2014b

Table 3-1. Summary of Demographic and Economic Statistics for the Socorro-Sierra Water Planning Region
Page 2 of 2

d. Agriculture

County	Farms / Ranches [a]			Most Valuable Agricultural Commodities[b]
	Number	Acreage		
		Total	Average	
Socorro	704	1,271,368	1,806	Milk from cows Cattle, calves Hay, other crops
Sierra	256	1,250,136	4,883	Livestock, poultry & products Hay, other crops Vegetables, potatoes, melons
Total Region	960	2,521,504	2,627	—

[a] USDA NASS, 2014, Table 1
[b] USDA NASS, 2014, Table 2



Explanation

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

Land surface ownership

- Bureau of Land Management
- Bureau of Reclamation
- Department of Defense
- National Forest Service
- Fish and Wildlife Service
- National Park Service
- Private
- State
- State Game and Fish
- State Park
- Tribal

Source:
BLM, 2003 & 2016 and U.S. Census Bureau, 2015

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Land Ownership

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Figure 3-2

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, economics, and land use 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, particularly Appendix D to the 2003 plan, includes a very comprehensive discussion of water law applicable to the region. However, since the accepted regional water plan for the Socorro-Sierra Water Planning Region was published in 2003, 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 Socorro-Sierra region is discussed in Section 4.1.2.

4.1.1.1 Regulatory Powers of the NMOSE

Several cases have addressed the regulatory powers of the Office of the State Engineer. In 2003, the New Mexico Legislature enacted NMSA 1978, § 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 Socorro-Sierra 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 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. 1. 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) secure the delivery of water within the CID, (2) meet the State's obligations to Texas under the Pecos River Compact (Compact), 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 a well field 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. Although the New Mexico prior appropriation doctrine theoretically does not allow for sharing of water shortages, 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.

Finally, and of great importance to the Socorro-Sierra planning region, the State Engineer's power to deny an application without holding an evidentiary hearing was addressed in a case involving the application filed by Augustin Plains Ranch, LLC (Applicant) to divert and use

water from the San Agustin Basin in Catron County, New Mexico. *Augustin Plains Ranch, LLC, v. Verhines and Kokopelli Ranch*, No. D-728-CV-2012-008, Memorandum Decision on Motion for Summary Judgment (11/14/2012). The Applicant sought to appropriate 54,000 acre-feet of groundwater per year for a wide variety of purposes within the broad areas of Catron, Sierra, Socorro, Valencia, Bernalillo, Sandoval, and Santa Fe counties. After notice of the application was published, several protestants filed a motion to dismiss the application, arguing that it was too broad in scope and did not adequately meet the requirements of a water rights application. The State Engineer denied the application without an evidentiary hearing, holding that the application did not sufficiently describe the place of use and the beneficial use to which the water would be applied. On appeal the district court addressed whether the State Engineer was justified in denying the application without holding an evidentiary hearing. The district court affirmed the State Engineer's denial of the application, agreeing that the application failed to specify the beneficial purpose and place of use of water, contrary to statute. The court also found that the application contradicted the New Mexico Constitution's declaration that water is owned by the public, not individuals, and failed to clearly demonstrate the water would be put to beneficial use, which is the basis of a water right.

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 hearings 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. 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 utilized 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 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 and Lower Rio Grande, both of which lie within the Socorro-Sierra planning region are listed as priority basins for the NMISC.

4.1.1.10 Ditch and 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, not in providing notice.

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) only allowed reversal of the acequia commissioners 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

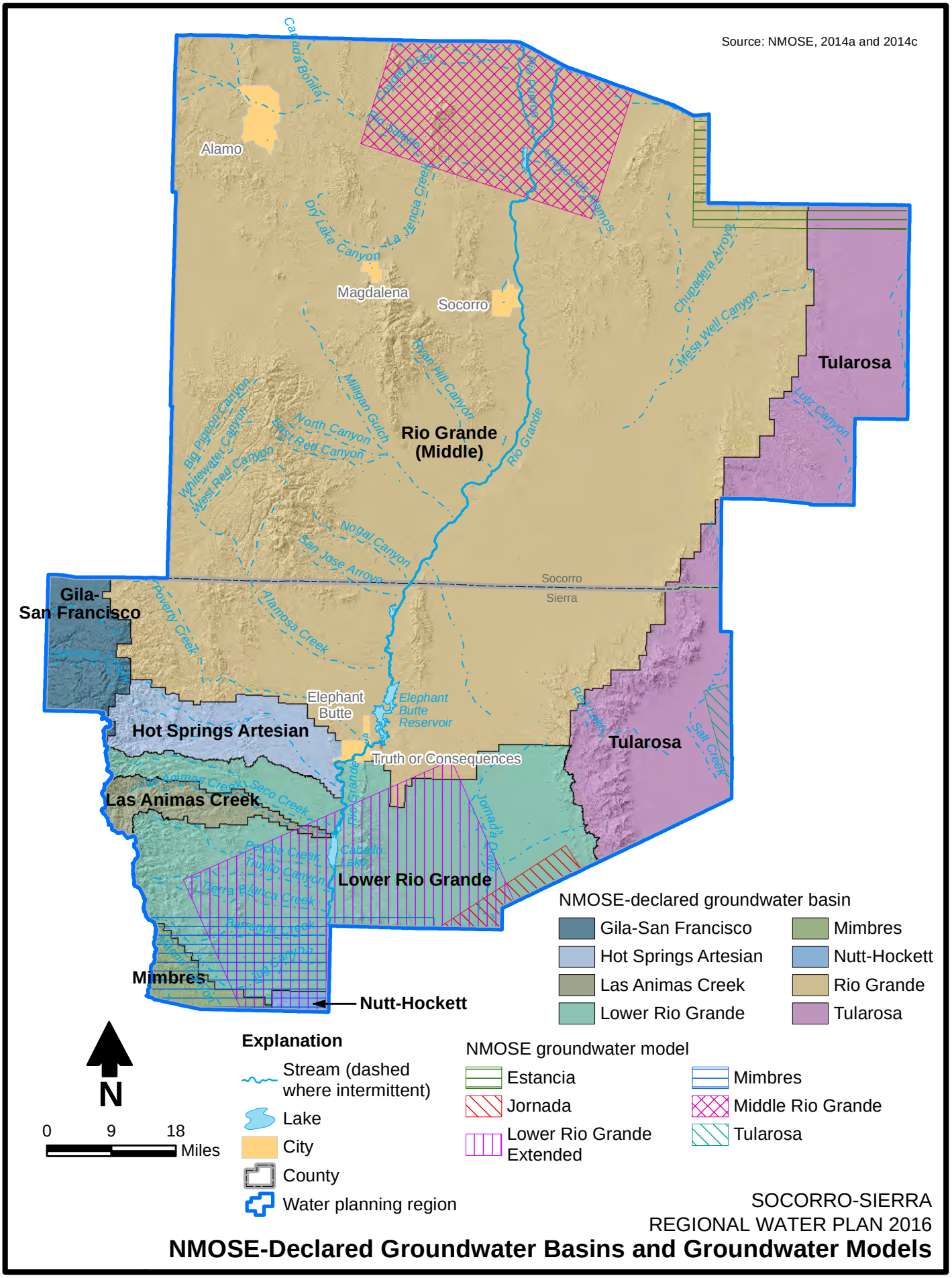
In New Mexico, water is administered generally by the State Engineer, who has the "general supervision of waters of the state and of the measurement, appropriation, distribution thereof and such other duties as required." NMSA 1978, § 72-2-1 (1982). To administer water throughout the state the State 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). In the Socorro-Sierra planning region, water masters have been appointed for the Middle Rio Grande, Lower Rio Grande, and Gila-San Francisco-San Simon Creek basins (only a small portion of the latter basin lies in the 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 2003 plan, Section 4.3, discusses the declared underground water basins (UWB) in the region in depth. As noted in the 2003 plan, the region includes parts of numerous declared UWBs; however, the largest in both counties is the Rio Grande UWB (Figure 4-1). In the Rio Grande UWB groundwater appropriations are administered through the Middle Rio Grande Administrative Guidelines for Review of Water Right Application (NMOSE, 2000). Socorro County also includes a small portion of the Tularosa Basin. In addition to the Rio Grande UWB, Sierra County includes portions of the Hot Springs, Las Animas Creek, Lower Rio Grande, Gila-



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SOCORRO-SIERRA
REGIONAL WATER PLAN 2016

NMOSE-Declared Groundwater Basins and Groundwater Models

Figure 4-1

San Francisco, Mimbres, Nutt-Hockett, and Tularosa UWBs (Figure 4-1). These basins and associated guidelines are addressed individually in Section 4.3 of the 2003 plan.

Changes to the laws governing these basins that have occurred since the publication of the accepted plan include:

- The Nutt-Hockett and Tularosa basins were extended in 2005.
- The Alamogordo-Tularosa Administrative Guidelines were updated in 2014. However, as with the original guidelines, the updates do not apply to the portions of the basin in Socorro or Sierra counties.
- For the Lower Rio Grande UWB, two State Engineer Orders on administration were issued in 2004.
    - One order creates a Water Master District located in Sierra and Doña Ana counties for the administration of groundwater in the Lower Rio Grande UWB. The water master has the power to appropriate, regulate, and control the waters of the District to prevent impairment of senior water right owners and the waste of water. *In the Matter of the Creation of the Lower Rio Grande Water Master District for the Administration of Rights to the Use of Groundwater from the Lower Rio Grande Groundwater Basin of New Mexico,* 12/03/2004.
    - The second order requires the metering and reporting by March 1, 2006 of all groundwater withdrawals, except for domestic and livestock. The order included metering of all lands within the Lower Rio Grande, Hot Springs, and Las Animas Creek UWBs. *In the Matter of the Requirements for Metering Groundwater Withdrawals in the Lower Rio Grande Watermaster District,* 12/03/2004.

4.1.2.3 AWRM Implementation in the Basin

Although the Lower Rio Grande Basin has been designated a priority basin for active management, AWRM regulations have not yet been issued for the basin. The Middle Rio Grande Basin has not been designated as a high priority for implementing AWRM regulations.

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, found in Chapter 73 of the New Mexico Statutes. The most important special districts in relation to water use in the Socorro-Sierra planning region are the Middle Rio Grande Conservancy District and the Elephant Butte Irrigation District. Both are discussed in Section 4.4 of the 2003 plan. Additionally, in the planning region there are community ditches, mutual domestics, and soil and water conservation districts.

4.1.2.5 State Court Adjudications in the Basin

The Lower Rio Grande stream system adjudication, *State of New Mexico ex rel. State Engineer v. Elephant Butte Irrigation Dist., et al.,* No. CV-96-888 (3rd Jud. Dist.), is an ongoing adjudication with close to 45 percent of the 13,979 water right subfiles now adjudicated (NMOSE, 2015). Major water rights issues are now before the adjudication court or in the process of implementation pursuant to an earlier order from the court. The parties currently are litigating the interests of the United States in the Rio Grande Project. To date, the court has determined the source and the amount of water for the Project. It next will decide the Project's priority date. After a two-week trial on that issue in September 2015, a motion to stay pending the outcome of *Texas v. New Mexico and Colorado*, discussed in Section 4.1.3, was filed. The motion to stay will be argued to the adjudication court on November 30, 2016.

In August 2011, the adjudication court set the irrigation water requirements for all crops in the Lower Rio Grande. That ruling is now being applied in adjudicating subfiles. The court established a basin-wide farm delivery requirement (FDR) of 4.5 acre-feet per acre per year, but allowed claimants to prove an FDR up to 5.5 acre-feet based on evidence showing greater historical use. Evidence from more than 600 claimants is now being evaluated.

In addition, there are two major expedited *inter se* proceedings in progress: one to adjudicate claims to water rights associated with the Copper Flat mine and the other to adjudicate claims to pre-1906 water rights derivative of the Rio Grande Dam and Irrigation Company.

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 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 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 and El Paso County Water Improvement District Number One 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 make the reservation a permanent homeland and to fulfill the purposes of the reservation.

Several courts have held that *Winters* rights are unique federally reserved rights because of the many purposes served by federally created Indian reservations. In 1963, the United States 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.).

Section 4.5.3.2 of the 2003 plan and Section D.3.6 of Appendix D to the 2003 plan provide a detailed discussion of federal reserved water rights. Lands with federal reserved rights or aboriginal rights within the Socorro-Sierra planning region include the following:

- Alamo Chapter Navajo Indian Reservation
- Gila National Forest
- Cibola National Forest
- National Forest Service Wilderness Areas
- Bosque del Apache National Wildlife Refuge
- Sevilleta National Wildlife Refuge
- White Sands Missile Range

- Bureau of Land Management lands

4.1.3.2 Interstate Stream Compacts

Interstate compacts become federal law once ratified by Congress. In the Socorro-Sierra region, the Rio Grande Compact plays a large role in water allocation. Signed in 1938 with Colorado, New Mexico, and Texas as parties, and approved by Congress in 1939, the Rio Grande Compact apportions amongst the three states the waters of the Rio Grande above Fort Quitman, Texas. The Compact is discussed in depth in the 2003 plan, Section 4.5.2.

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, which would directly affect water users in the Middle Rio Grande valley. Thus the outcome of the case will be very important to the Socorro-Sierra planning region as portions of both the Middle and Lower Rio Grande basins are in the region.

4.1.3.3 Treaties

One treaty indirectly governs water use in the Socorro-Sierra planning 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 Socorro-Sierra region, any use of water upstream of this reach may impact the downstream distribution of water.

Also of importance to water rights administration 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. The treaty is mentioned briefly in the 2003 plan, Appendix D, Section D.3.6.2.1.

4.1.3.4 Federal Water Projects

The San Juan-Chama Project and the Rio Grande Project are extremely important federal projects in the planning region. The San Juan-Chama Project is mentioned briefly in the 2003 plan, Section 4.5.3.1. A full description of the San-Juan Chama Project can be found in the 2009 update to the Jemez y Sangre Regional Water Plan or the 2004 Middle Rio Grande Regional Water Plan, Section 5.5.4, and 2003 Overview, Supporting Document H-6, Section V.

The Rio Grande Project is the other major federal project in the region. In 1947 the U.S. Bureau of Reclamation (Reclamation) and the U.S. Army Corps of Engineers (Corps) completed a

comprehensive plan intended to improve and stabilize the Rio Grande's middle valley reaches. The plan included dams for flood and sediment control that were intended to improve operation of the Rio Grande and to ensure deliveries under the Rio Grande Compact. The plan also offered the possibility of a federal loan to rehabilitate the irrigation and drainage systems of the Middle Rio Grande Conservancy District (MRGCD).

Congress authorized the Rio Grande Project in 1948. Flood Control Acts of 1948 and 1950 (Pub. L. No. 80-855; Pub. L. No. 81-516) ("The Act"). Congress also authorized the Corps to construct flood control reservoirs and levees for flood protection. The Act authorized Reclamation to undertake the rehabilitation of the MRGCD works and to pay off outstanding MRGCD bond indebtedness.

In exchange for Reclamation rehabilitating the MRGCD works and paying its debts, the MRGCD entered into a repayment contract with Reclamation in 1951. As security for the loan to pay off the MRGCD debt and to ensure payment of the long-term costs of rehabilitation, the MRGCD agreed to transfer assets to the United States as needed to fully protect its security interests. Pursuant to the terms of the 1951 contract, the MRGCD was to assign its water rights to the United States as needed by the Secretary of Interior, but no beneficial use rights by individual irrigators on the land were assigned. Ultimately in 1963, the MRGCD transferred to Reclamation only the right to store water in El Vado Reservoir. The MRGCD has repaid the 1951 contract, but there has been litigation between the MRGCD and Reclamation over the title and to certain parcels and works within the project for a number of years.

Regarding operation of the irrigation works, Reclamation operated the MRGCD works for a period of time in order to protect its security interest and to ensure that the contract was repaid. In the 1970s, Reclamation transferred these duties associated with the diversion dams back to the MRGCD. As part of the transfer, Reclamation and the MRGCD agreed that for purposes of efficiency, and because El Vado Reservoir operations were coordinated with operations of other reservoirs on the Rio Grande, Reclamation would operate El Vado Reservoir to provide releases of water for irrigation purposes with the MRGCD. Thus, the Project requires coordination between the MRGCD and Reclamation.

In the Lower Rio Grande the project furnishes irrigation water to approximately 178,000 acres of land and electric power for communities and industries in New Mexico and Texas. Project lands occupy the river bottom land of the Rio Grande Valley in south-central New Mexico and west Texas. Water is also provided for diversion to Mexico by the International Boundary and Water Commission-United States Section to irrigate about 25,000 acres in the Juarez Valley. The project includes Elephant Butte and Caballo dams. The project has been the source of conflict over the years between Elephant Butte Irrigation District, El Paso County Water Improvement District Number One, and Reclamation.

Currently, the Rio Grande Project is the subject of litigation again between the State of New Mexico and Reclamation, as discussed in Section 4.3.1.

4.1.3.5 Federal Adjudications in the Basin

The Las Animas Creek Basin adjudication decree (Decree No. 6427) allocates water in the Las Animas Creek Basin. The decree is discussed briefly in the 2003 plan, Section 4.3.3.

4.1.4 Tribal Law

The Navajo Alamo Chapter is within the planning region, and the Navajo Nation Water Code (1984) (22 N.N.C. §§ 1101 et seq.) applies to water use at the Chapter. The Code is applicable to "all the waters of the Navajo Nation," which include all surface and groundwater. The Code further declares that ". . . [I]t shall be unlawful for any person . . . to . . . make any use of . . . water within the territorial jurisdiction of the Navajo Nation unless . . . this Code [has] been complied with. No right to use water, from whatever sources, shall be recognized, except use rights obtained under and subject to this Code."

4.1.5 Local Law

Local laws addressing water use have been implemented by both municipalities and counties within the planning region. The Appendix D to the 2003 plan, Section D.3.5 provides a general overview of city and county regulation of water.

4.1.5.1 Socorro County

Water use in Socorro County is guided by the *Northern Socorro County Comprehensive Plan* (Sites Southwest, 2006) and regulated through ordinances and a resolution.

The Comprehensive Plan emphasizes the use of water in the County and outlines as County goals several relating to water, including a clean and safe source of drinking water, sufficient water for domestic and agricultural use, and the prevention of groundwater contamination.

Socorro County Ordinance No. 93-02 establishes the environmental planning and review process with the purpose of creating an environmental planning process that ensures the protection of the physical environment as well as the customs, culture, and economic stability of the county.

Socorro County Ordinance No. 97-06 regulates the subdivision of land and requires the submittal of a water quantity and availability plan and a water quality plan for approval of a subdivision. *See* Section 2, Art. I(C) and (D); Section 3, Art. II(B) and (C).

Socorro County Resolution No. 2012-40 is a declaration of a public welfare policy for the use of water within the County and promotes as a matter of policy that water rights should remain within their respective basins, watersheds should be properly managed, an adequate supply of clean water is necessary, and conservation is needed.

4.1.5.2 City of Socorro

The City of Socorro's City Code, Section 207-11(F), requires that upon approval and acceptance of the final plat of the proposed subdivision by the City, the subdivider transfer or assign to the City all water rights appurtenant to the land to be subdivided or water rights sufficient to supply domestic water to the subdivision (½ acre-foot per dwelling unit), or if the land to be subdivided has no water rights assigned to it, pay a fee of $250 per lot to the City for acquisition of water rights.

4.1.5.3 Village of Magdalena

The Village of Magdalena has no specific ordinances relating to water use.

4.1.5.4 Sierra County

Water use in Sierra County is governed by several ordinances.

- Ordinance No. 11-007 (subdivision regulations): Section 4.2 of the ordinance addresses water quantity and quality sufficiency for future subdivisions.
- Ordinance No. 09-002 (planning ordinance).
- Ordinance No. 92-012 (environmental planning review process).

4.1.5.5 City of Truth or Consequences

Water use in Truth or Consequences is guided by the *City of Truth or Consequences Comprehensive Plan 2014* (Consensus Planning, Inc., 2014) and regulated through its Code of Ordinances. The Comprehensive Plan, Section 6.8, sets forth goals for water use in the City, including maintaining, upgrading, and optimizing the City's water production and distribution system and promoting the sustainable and efficient management of water resources through community conservation efforts and education. Section 14-44 of the City Code regulates water conservation—including prohibiting water waste and restricting watering based on the month of the year, day of the week, and time of day—and outlines emergency conservation measures, as necessary.

4.1.5.6 City of Elephant Butte

The City of Elephant Butte regulates water use through its Code of Ordinances. Section 52.19 of the Code, which applies to the City water system, prohibits waste and authorizes the mayor to implement limitations on water use during a water emergency. Section 52.51 governs domestic wells and prohibits the drilling of new domestic wells in areas served with the public water system.

4.1.5.7 Village of Williamsburg

The Village of Williamsburg has no specific ordinances relating to water use.

4.1.5.8 Town of Hillsboro

The Town of Hillsboro has no specific ordinances relating to water use.

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.*

The animal species in the Socorro-Sierra planning region that are subject to protection under the ESA are as follows:

- Yellow-billed cuckoo (threatened): Socorro and Sierra counties

- Mexican spotted owl (threatened; implementation of final recovery plan): Socorro and Sierra counties
- Southwestern willow flycatcher (endangered; implementation of final recovery plan): Socorro and Sierra counties
- Least tern (endangered): Socorro County
- Rio Grande silvery minnow (endangered; implementation of final recovery plan): Socorro and Sierra counties
- New Mexico meadow jumping mouse (endangered): Socorro County
- Chiricahua leopard frog (threatened; implementation of recovery plan): Socorro and Sierra counties

Of the threatened and endangered species found in the region, the protection and recovery of the Southwestern willow flycatcher, yellow-billed cuckoo, Rio Grande silvery minnow, Chiricahua leopard frog, and New Mexico meadow jumping mouse are most likely to affect water planning within the region. These animals all rely on riparian habitat for survival. Any actions that are likely to harm the habitat used by these species will be subject to strict review and possible limitation.

There is also a threatened riparian plant species with critical habitat in the planning region, the Pecos sunflower (*Helianthus paradoxus*). Again, management of the critical habitat area for the sunflower may impact water use in the planning region.

There has been significant litigation in the Socorro-Sierra planning region regarding the ESA. Section 4.5.1.1 of the 2003 plan discusses the original silvery minnow case in depth. In short, in this case environmental groups challenged the validity of a Biological Opinion issued by the USFWS concerning the effects of federal water project activities on the silvery minnow, arguing that the Biological Opinion did not adequately consider all of the water in the Rio Grande, including water under San Juan-Chama Project contracts. The court vacated all rulings in the case, and issues raised about the federal use of water for endangered species remain unresolved. The protection of the silvery minnow is guided by the Recovery Plan for Rio Grande Silvery Minnow. 75 FR 7625 (February 22, 2010).

Two new cases regarding ESA issues in the Socorro-Sierra region, specifically in the Middle Rio Grande Valley, were filed recently. In the first case, the WildEarth Guardians (WEG) filed a Petition for Review of Agency Action, against the U.S. Army Corps of Engineers and the USFWS in the San Acacia Reach of the Rio Grande regarding the San Acacia Levee Project (Levee Project). *WildEarth Guardians v. U.S. Army Corps of Engineers and U.S. Fish and Wildlife Service*, Case No. 1:15-cv-00159-SMV-KBM (filed 02/24/2015). The Petition alleges

that the Corps' authorization of the Levee Project violates the National Environmental Policy Act (NEPA), 42 U.S.C. §4321 et seq., and the Administrative Procedure Act (APA), 5 U.S.C. 701 et seq. Specifically, the WEG alleges that the Corps violated the NEPA by failing to take a hard look at the direct, indirect, and cumulative impacts of the Levee Project to endangered species. WEG alleges further that the USFWS's Biological Opinion for the Levee Project violates the ESA and the APA. The case has been stayed and no further action has been taken.

In a second case, the WEG filed a complaint against the Corps and the Bureau of Reclamation (Reclamation) alleging, among other things, that (1) Reclamation's operations and activities in the Middle Rio Grande result in jeopardy to the Rio Grande silvery minnow and the southwestern willow flycatcher and also result in the adverse modification and/or destruction of the species' designated critical habitat in violation of the substantive requirements of ESA §7(a)(2, (2) Reclamation's operations and activities in the Middle Rio Grande have caused, and continue to cause, the incidental take of silvery minnows in violation of ESA § 9, (3) the Corps' failure to consult with the USFWS to the full extent of its discretionary authorities over operations and activities has resulted in the adverse modification and/or destruction of the species' designated critical habitat in the Middle Rio Grande, in violation of the procedural requirements of ESA § 7(a)(2), and (4) Reclamation failed to consult with the USFWS as to the full extent of its discretionary authorities over operations and activities in the Middle Rio Grande when needed to assure compliance with the ESA in violation of the procedural requirements of ESA §7(a)(2).

The Middle Rio Grande Conservancy District (MRGCD) intervened as a defendant in the case. The federal defendants and the MRGCD filed a motion to dismiss. The federal district court filed a Memorandum Opinion and Order on September 23, 2015 granting in part and denying in part the motion to dismiss. The court dismissed WEG's claim that Defendant Reclamation violated the procedural requirements of ESA § 7(a)(2). However, the court also determined that the WEG's claim that Reclamation violated the substantive provisions of ESA § 7(a)(2) was justiciable.

The district court issued a second Memorandum Opinion and Order on September 23, 2015 related to the WEG's claims against the Corps. The district court did not dismiss the WEG's claims against the Corps; in the decision the court found that the Corps does engage in affirmative actions relating to the operation of its Middle Rio Grande dams and reservoirs and, accordingly, the agency has sufficient discretionary authority to modify its actions to benefit endangered species.

The case is currently pending before the federal district court.

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).

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 Socorro-Sierra Water Planning Region, all of the federally listed species discussed above are protected also under the New Mexico Act.

4.2.2 Water Quality Laws

4.2.2.1 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). The Clean Water Act (CWA), 33 U.S.C. §§ 1251 to 1387—including the National Pollutant Discharge Elimination System (NPDES) permitting program (Section 402) and the dredge and fill permit program (Section 404)—is discussed in detail in Section 4.5.1.2 of the 2003 plan.

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 the U.S. Environmental Protection Agency (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 Socorro-Sierra planning region, Elephant Butte and Caballo reservoirs and numerous segments of the Rio Grande, Rio Puerco, and Las Animas and Taylor creeks 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

Since the 2003 plan was published, there have been significant legal changes to the term "waters of the United States" as used in the CWA. 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 groundwaters 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 groundwater quality standards, regulations requiring discharge permits, and regulations requiring abatement of groundwater contamination. 20.6.2

NMAC. The water quality standards for groundwater 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

The Navajo Nation has adopted surface water quality standards and monitors water quality on a regular basis.

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

4.3.1 Ongoing or Threatened Litigation that May Affect Water Management

State of New Mexico v. U.S. Bureau of Reclamation, et al., No. 1:2011-cv-00691-JB-ACT (D.N.M. filed August 8, 2011) involves the 2008 Operating Agreement for the Rio Grande Project. The Operating Agreement was developed during settlement of litigation between the Elephant Butte Irrigation District (EBID), El Paso County Water Improvement District Number One, and the U.S. Bureau of Reclamation (USBR). The State of New Mexico asserts that implementation of this agreement appears to have reduced EBID's allocation of Rio Grande Project water in full-supply years by more than 150,000 acre-feet. Furthermore, the State of New Mexico asserts that the USBR illegally took New Mexico credit water as allocated under the Rio Grande Compact and violated NEPA in implementing the agreement. The MRGCD has sought to intervene in the case because of the impacts the Operating Agreement have on upstream storage and relinquishment related to the Rio Grande Compact, and accordingly, on the water users in the middle valley. The case is currently stayed pending action by the U.S. Supreme Court in *Texas v. New Mexico and Colorado*, No. 220141 Original (U.S. Supreme Court).

In addition, as discussed in Section 4.1.3, *Texas v. New Mexico and Colorado,* No. 220141 Original (U.S. Supreme Ct.), may impact water use in the region.

4.3.2 Other Important Issues Related to Water Management in the Region

Other matters of importance to water users in the region are the outcomes of the Lower Rio Grande adjudication, as well as the Augustin Plains Ranch water rights transfer application, both addressed above in detail (Sections 4.1.1.1 and 4.1.1.5). Also, any potential legal barriers to the acquisition of water for the Alamo Navajo Chapter are important to water use in the region (AMEC, 2014).

Also, on January 9, 2012 the Bureau of Land Management (BLM) issued a Notice of Intent to Prepare an Environmental Impact Statement for Proposed Copper Flat Mine Plan of Operations, Sierra County, NM. 77 FR 1080 (01/09/12). The Copper Flat mine is a 27-year project with a planned location 4 miles from Hillsboro and a disturbance area of 745 acres. Water for the proposed operation would be obtained from a well field located on land administered by the BLM, approximately 8 miles east of the mine. The Draft Environmental Impact Statement (Draft EIS) was issued on November 30, 2015. According to the Draft EIS, impacts from the mine's well field clearly affect both the Rio Grande and Caballo Reservoir, and possibly other water sources in the area. Comments to the Draft EIS were due April 4, 2016, but the final EIS has not been issued. The outcome of the EIS process and the potential groundwater withdrawals will impact 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 Socorro-Sierra 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 2003 plan and provide key new or revised information that has become available since submittal of the 2003 regional water plan. The information in this section regarding surface and groundwater supply and water quality is thus drawn largely from the *Socorro-Sierra Regional Water Plan* (DBS&A, 2003) 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 Socorro-Sierra region are:

- Because the region relies heavily on surface water, drought is a major concern. For New Mexico Climate Division 5, which covers a large portion of the planning region, 2011, 2012, and 2013 were all severe to extreme drought years (NCDC, 2014), and the winter snowpack for 2014 was also very low. This is a particular concern for agricultural users that are dependent on surface water; therefore drought preparedness (developing drought contingency plans and shortage sharing agreements) is important for each community and irrigation system in the region.

- The Rio Grande is the main river in the planning region. As it flows through Socorro and Sierra counties, the river struggles to maintain a geomorphic equilibrium. Large quantities of sediment are contributed to the river system from the Rio Puerco and Rio Salado in the northern part of the region as well as from numerous smaller ungaged tributaries throughout the length of the river in the region. The overall geomorphic and hydrologic conditions of the Rio Grande within the region make water delivery and management activities difficult.

- Much of the groundwater in the region is within the Rio Grande Underground Water Basin and is considered to be stream-connected. The Rio Grande is considered to be fully appropriated, and any new diversion of surface water or stream-connected groundwater requires the transfer of a valid water right or application for a new domestic or livestock well. The availability of water rights may thus be a limiting factor in meeting the future water needs of the region. Any new water uses that impact the flows

of the Rio Grande must be offset through return flow, the transfer of water rights, and/or supplementation by a new source of water. No mechanism is presently in place in the southern portion of the planning region to allow transfers of Rio Grande Project water from the Elephant Butte Irrigation District (EBID) to non-agricultural uses.

- In 2013 the State of Texas initiated a lawsuit in the U. S. Supreme Court over the Rio Grande Compact, specifically water management and water use by New Mexico below Elephant Butte Dam, and names New Mexico and Colorado as defendants. The United States has joined in this lawsuit. The outcome of this lawsuit, whether through settlement or court order, may have significant impacts on water management in the Lower Rio Grande region.

- Water users throughout the Middle Rio Grande that are seeking to obtain water rights to meet growing demands, such as municipalities, are challenged because they must acquire an existing senior water right. No new appropriations are available in the region. After the groundwater basin was closed to new appropriations in 1956, a number of entities applied for and were issued groundwater pumping permits with the condition that the effects of the pumping on the river would be offset when they occur. Municipal return flow, San Juan-Chama Project water, and the transfer of senior water rights are used as offsets as required by the specific permit requirements, with return flows comprising the greatest volume of offset. When the effects on the river are fully realized, the amount of senior water rights needed to offset the pumping under these

Rio Grande Compact

Signed in 1938, with Colorado, New Mexico, and Texas as parties, and approved by Congress in 1939, the Rio Grande Compact apportions the surface waters of the Rio Grande 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 representatives from all three states and from the federal government.

Given the variable climate, the Compact provides for debits and credits to be carried over from year to year until extinguished under provisions of the Compact. Engineer advisers to the Compact commissioners meet prior to each annual Rio Grande Compact Commission meeting to balance scheduled and actual delivery of water under the Compact, taking into account the natural flow of the river and accrued credits or debits. This Compact accounting determines Colorado's and New Mexico's required actual delivery obligation for that year.

The Compact affects water planning in New Mexico in two primary ways:

- The Compact requires that a proportion of the water that enters the Middle Rio Grande valley must be delivered to Elephant Butte Reservoir. This requirement limits depletions in the 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.

permits is roughly equal to all of the transferrable senior water rights from the irrigated land along the Rio Grande from north of Albuquerque to Elephant Butte (Schmidt-Petersen, 2011).

- A new Operating Agreement for the Rio Grande Project, a portion of which is located in the Socorro-Sierra region, developed during settlement of litigation between EBID, EPCWID #1, and USBR in Texas Federal District Court, was implemented in 2008. Implementation of this agreement appears to have reduced EBID's allocation of Rio Grande Project water in full-supply years by more than 150,000 acre-feet, and this large decrease is likely to lead to increased dependence on groundwater for irrigation. Many questions persist regarding the fairness and sustainability of the Operating Agreement as it has been implemented. The New Mexico Attorney General sued the USBR in 2011 regarding this Operating Agreement and the USBR's unauthorized release of New Mexico's Rio Grande Compact credit water to EPCWID #1. The judge in the case has stayed any action in this lawsuit pending action by the U. S. Supreme Court in the Rio Grande Compact litigation. Continued conflict associated with this Agreement is likely.

- Water use below the Otowi gage is restricted by the Rio Grande Compact based on the Otowi Index Supply, and therefore the supplies of the Jemez y Sangre, Middle Rio Grande, and Socorro-Sierra planning regions are linked. Furthermore, the majority of water entering the region along the Rio Grande is required to be delivered to Elephant Butte Reservoir.

- Augustin Plains Ranch LLC applied to the NMOSE for a permit to pump 54,000 acre-feet of groundwater in October 2007. The State Engineer denied the application and the denial was affirmed in November 2014 by the District Court. In an amended application, the applicant stated that the purpose of the application is to provide water by pipeline to supplement or offset the effects of existing uses and new uses over a large part of the Rio Grande Basin, in order to reduce the stress on the current water supply in the Rio Grande Basin. In the November 2014 District Court decision, the Court determined that the State Engineer had to deny the permit because the application failed to specify a beneficial use and because the application contradicts beneficial use as the basis of a water right and instead relied on diversion to establish the right (NMELC, 2015). On September 7, 2016, Augustin Plains Ranch published notice that it had filed a corrected application numbered RG-89943 for a Permit to Appropriate Groundwater in the Rio Grande Underground Water Basin of the State of New Mexico. Protests to the original application are considered valid for the corrected application, but additional protests are expected.

- The Village of Magdalena could not produce water from their only well for most of June 2013 and had to resort to water hauling. In response, older wells were rehabilitated, and the newer well gradually recovered. To better understand the groundwater resources in the area, the New Mexico Bureau of Geology and Mineral Resources Aquifer Mapping Program assessed hydrogeologic information and measured water levels in 37 wells. This study indicated that most of the wells produce only small amounts of water and that the few wells that have higher yields are located near the Magdalena Fault (Timmons, 2014).

- There are 46 mostly small rural drinking water systems within the region (NMED, 2014c.) These small systems face challenges in financing infrastructure maintenance and upgrades and complying with water quality monitoring and training standards. Though the source water for these systems is generally good-quality groundwater, the maintenance, upgrades, training, operation, and monitoring that are required to ensure delivery of water that meets drinking water quality standards is a financial and logistical challenge for these small systems.

- The Federal Emergency Management Administration recently released new floodplain maps of Socorro and Sierra counties. The new maps define hazard areas and indicate flood insurance rate boundaries (FEMA, 2012; Data.Gov, 2014).

- Most of the water in the region is used for irrigated agriculture, and the Middle Rio Grande Conservancy District (MRGCD) is the largest user. The MRGCD has four major river diversion points, one of which is within the Socorro-Sierra region, and a large network of irrigation canals in the area between Cochiti and the Bosque del Apache National Wildlife Refuge. Additionally, passive diversion by MRGCD occurs from the river to the adjacent riverside drains. MRGCD has storage rights in El Vado Reservoir that it can use when native flow is insufficient to meet MRGCD irrigation demand. Providing sufficient deliveries for agricultural users during multi-year droughts is an important issue in the region.

- The MRGCD has not yet submitted documentation regarding the water that it has put to beneficial use since its permit was issued in 1930. Without such documentation and a thorough evaluation of the documentation by the State Engineer, the nature and extent of the rights under the 1930 permit will remain unclear.

- Endangered species and environmental restoration issues may increase in importance. Large populations of southwestern willow flycatcher and yellow billed cuckoo, both federally listed species under the Endangered Species Act, reside in the dry portion of the reservoir pool of Elephant Butte Reservoir. The USBR is currently conducting an EIS on the 2008 Operating Agreement. Consultation will be required with the U.S. Fish and Wildlife Service over operations of Elephant Butte and Caballo reservoirs in regard to

both species. The outcome of the consultation is unknown but could have an effect on Rio Grande Project operations. Furthermore, a number of non-government organizations have taken a keen interest in the potential for aquatic and related wetland restoration in and along the main channel of the Rio Grande within the EBID and Lower Rio Grande basin.

5.1 Summary of Climate Conditions

The 2003 regional water plan (DBS&A, 2003) included an analysis 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 Socorro-Sierra 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 Socorro and Sierra counties and identifies two stations that were used for analysis of weather trends. These stations were selected based on location, how well they represented conditions in their respective counties, and completeness of their historical records. In addition to the climate stations, data were available from one snowpack telemetry (SNOTEL) station and were used to document snowfall in the Socorro-Sierra region (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 selected climate stations are detailed in Table 5-2, and average summer and winter temperatures for each year of record are shown on Figure 5-2.

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 (rainfall and snowmelt) 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 one SNOTEL station in the planning region, the Lookout Mountain station located in the mountains on the eastern side of Sierra County; this station provides 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 Lookout Mountain station is provided on Figure 5-5.

Table 5–1. Socorro–Sierra Climate Stations

Climate Stations [a]	Latitude	Longitude	Elevation	Precipitation		Temperature	
				Data Start	Data End	Data Start	Data End
Socorro County							
Augustine 2E	34.08	–107.62	7,000	4/1/1926	Present	5/1/1926	Present
Bernardo	34.42	–106.83	4,735	1/1/1936	Present	4/1/1962	Present
Bingham 2 NE	33.91	–106.35	5,551	9/1/1939	Present	10/1/1939	Present
Bosque Del Apache	33.80	–106.89	4,512	2/1/1894	Present	2/1/1894	Present
Claunch	34.13	–106.00	6,424	5/1/1940	9/30/1952	9/1/1944	12/31/1944
Glorieta Ranch	33.57	–107.35	7,200	10/1/1910	12/31/1928	9/1/1913	12/31/1928
Kelly Ranch	34.03	–107.13	6,699	10/1/1945	Present	—	—
Magdalena	34.12	–107.23	6,540	4/1/1905	10/31/1993	2/1/1906	10/31/1993
Rienhardt Ranch	33.75	–107.21	5,450	9/1/1951	5/31/2012	—	—
San Marcial	33.68	–106.98	4,491	1/1/1897	5/31/1949	1/1/1897	12/31/1930
Socorro	34.08	–106.88	4,585	2/1/1893	Present	1/1/1893	Present
Sierra County							
Aleman Ranch	32.93	–106.93	4,521	1/1/1943	9/30/2000	2/28/1955	9/30/2000
Caballo Dam	32.90	–107.31	4,190	9/1/1936	Present	9/1/1936	Present
Chloride Ranger Station	33.35	–107.65	6,204	12/1/1904	12/31/2013	12/1/1904	12/31/2013
Elephant Butte Dam	33.15	–107.18	4,576	8/1/1908	Present	10/1/1908	Present
Engle	33.18	–107.03	4,774	12/1/1894	5/31/1961	12/1/1894	12/31/1949
Engle 14 E	33.22	–106.80	5,823	6/1/1961	5/31/1976	—	—
Engle 15 NE	33.30	–106.83	5,282	6/1/1976	12/31/1988	—	—
Engle CAA Airport	33.23	–107.02	4,849	1/1/1941	5/31/1950	1/1/1948	5/31/1950
Hardin Ranch	33.25	–106.73	6,004	7/1/1942	9/30/1951	—	—

Source: WRCC, 2014

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

— = Information not available

NR = Temperature is not recorded at SNOTEL stations.

Table 5–1. Socorro–Sierra Climate Stations

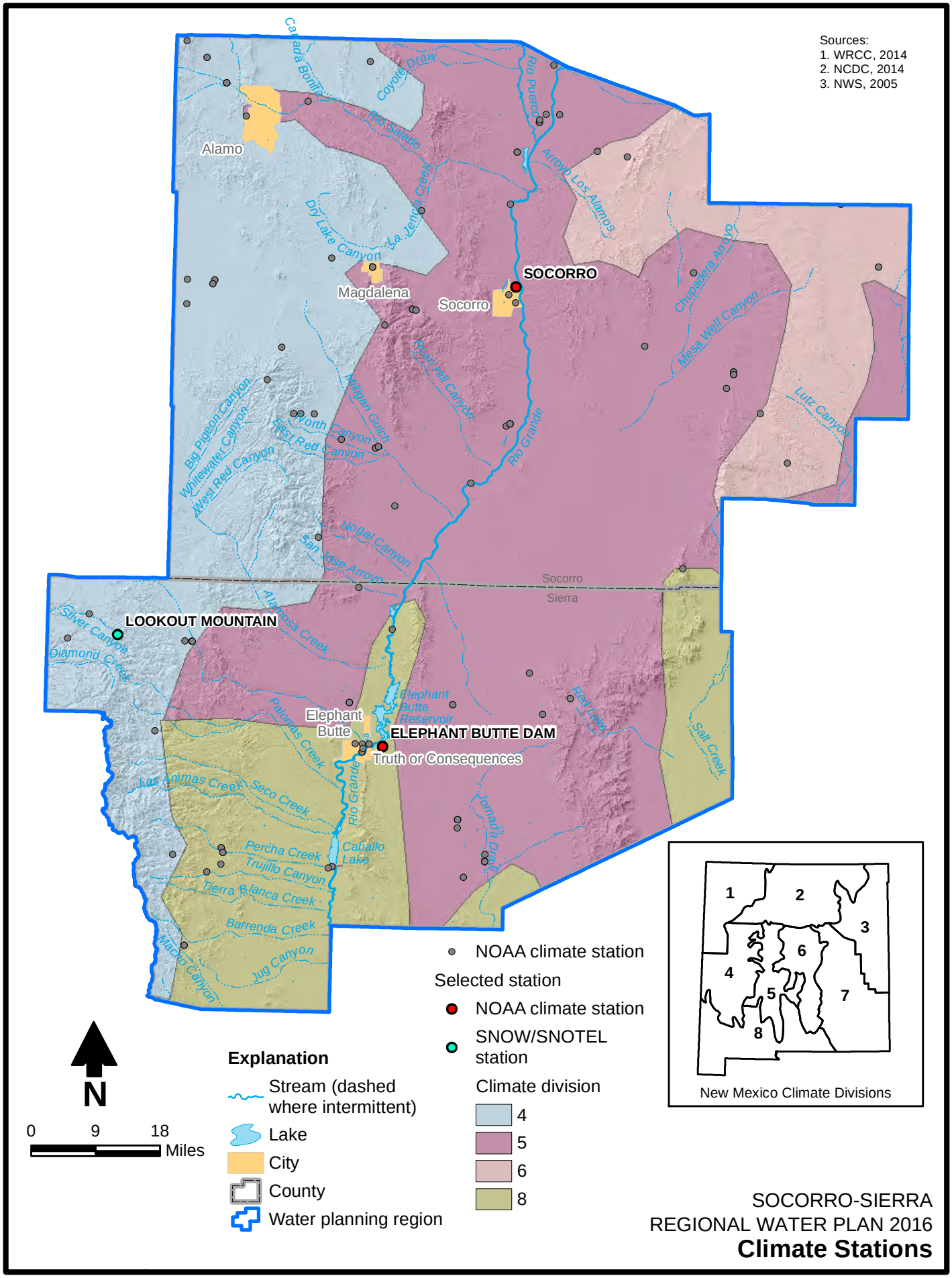
Climate Stations [a]	Latitude	Longitude	Elevation	Precipitation		Temperature	
				Data Start	Data End	Data Start	Data End
Sierra County (cont.)							
Hillsboro	32.92	–107.56	5,270	1/1/1893	Present	1/1/1893	Present
Hot Springs CAA Airport / Truth or Consequence Airport, NM	33.23	–107.27	4,826	5/1/1950	Present	6/1/1950	Present
Inman Ranch	33.40	–107.90	7,805	1/1/1941	7/31/1954	—	—
Kingston Ranger Station	32.92	–107.68	6,043	12/1/1915	10/31/1953	5/1/1939	7/31/1953
Latham Ranch / Laney Ranch, NM	32.73	–107.65	5,643	5/1/1905	9/30/1978	—	—
Mc Cauley Ranch	33.35	–107.95	6,975	8/1/1954	11/30/1968	—	—
Narrows	33.38	–107.17	4,403	1/1/1948	7/31/1964	—	—
Pankey Ranch	33.47	–107.25	4,452	4/1/1938	5/31/1954	—	—
Park Ranch	32.73	–107.65	5,703	5/1/1905	9/30/1978	—	—
Truth or Consequences	33.14	–107.23	4,382	4/1/1984	Present	6/1/1982	Present
Wedgewood Place	32.88	–107.60	5,423	9/1/1943	1/31/1955	—	—
Aleman Ranch	32.93	–106.93	4,521	1/1/1943	9/30/2000	2/28/1955	9/30/2000
SNOTEL Stations							
Lookout Mountain - SNTL	33.36	–107.83	8,500	11/15/1978	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.


Sources:
1. WRCC, 2014
2. NCDC, 2014
3. NWS, 2005
Alamo
Magdalena
Socorro
SOCORRO
Arroyo Los Alamos
Rio Puerco
Rio Salado
Coyote Draw
Cañada Bonita
La Jencia Creek
Dry Lake Canyon
Chupadera Arroyo
Mesa Well Canyon
Lutz Canyon
Ryan Hill Canyon
Milligan Gulch
Rio Grande
Big Pigeon Canyon
Whitewater Canyon
West Red Canyon
East Red Canyon
North Canyon
Nogal Canyon
San Jose Arroyo
Socorro
Sierra
LOOKOUT MOUNTAIN
Silver Canyon
Diamond Creek
Alamosa Creek
Elephant Butte Reservoir
Elephant Butte
ELEPHANT BUTTE DAM
Truth or Consequences
Red Lake
Salt Creek
Palomas Creek
Las Animas Creek
Seco Creek
Rio Grande
Jornada Draw
Percha Creek
Trujillo Canyon
Caballo Lake
Tierra Blanca Creek
Barrenda Creek
Jug Canyon
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Explanation
Stream (dashed where intermittent)
Lake
City
County
Water planning region
NOAA climate station
Selected station
NOAA climate station
SNOW/SNOTEL station
Climate division
4
5
6
8
1
2
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6
7
8
New Mexico Climate Divisions
SOCORRO-SIERRA
REGIONAL WATER PLAN 2016
Climate Stations
S:\PROJECTS\WR12.0165_STATE_WATER_PLAN_2012\GIS\MXD\SFIGURES_2016\SOCORRO_SIERRA\FIG5-1_CLIMATE_STATIONS.MXD 6/18/2016

Figure 5-1

Table 5-2. Temperature and Precipitation for Selected Climate Stations Socorro-Sierra Water Planning Region

Station Name	Precipitation (inches)				Temperature			
					Average (°F)			
	Average Annual [a]	Minimum [b]	Maximum [b]	% of Possible Observations [c]	Annual [d]	Minimum [e]	Maximum [e]	% of Possible Observations [c]
Elephant Butte Dam, NM	9.38	3.77	16.94	99.2	61.2	47.7	74.7	98.9
Socorro, NM	9.62	3.03	22.40	98.4	57.5	40.9	74.1	88.9

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.

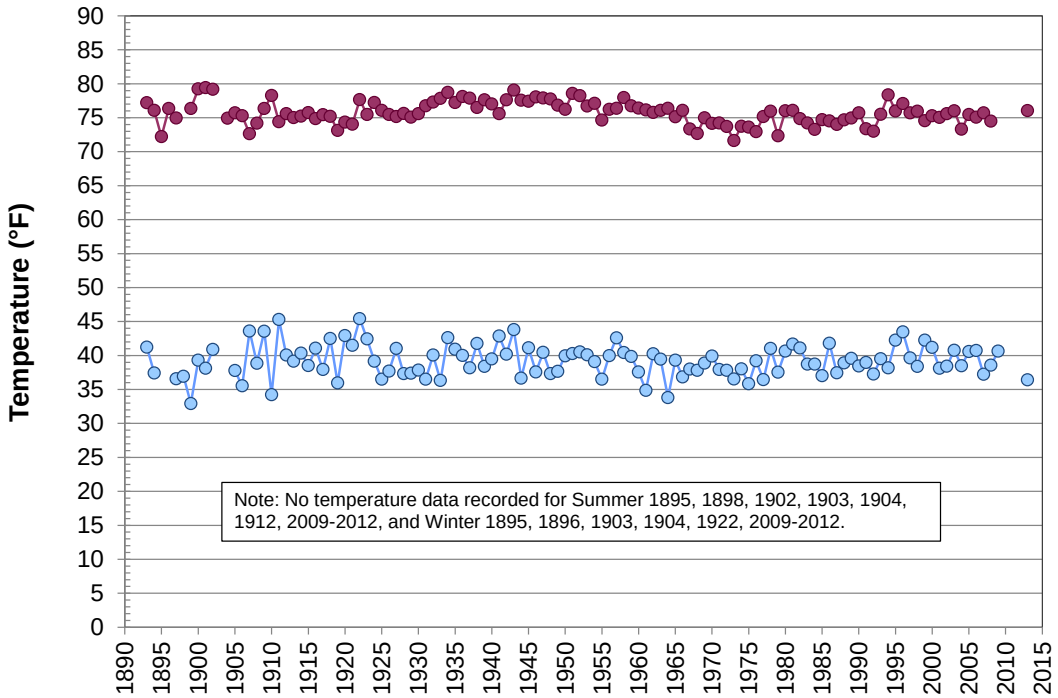
[b] Minimum and maximum recorded annual precipitation amounts for each station.

[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).

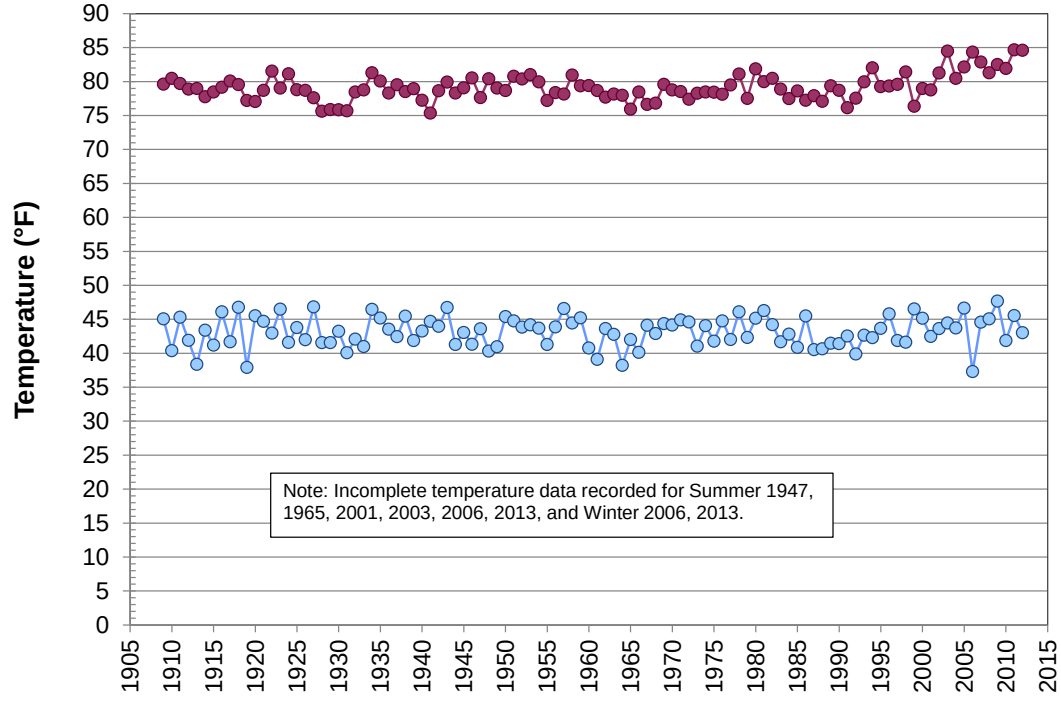
[d] Average of the daily average temperatures calculated for each station.

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

Socorro



Elephant Butte Dam



SOCORRO-SIERRA
REGIONAL WATER PLAN 2016

Average Temperature
Socorro and Elephant Butte Dam Climate Stations

Figure 5-2

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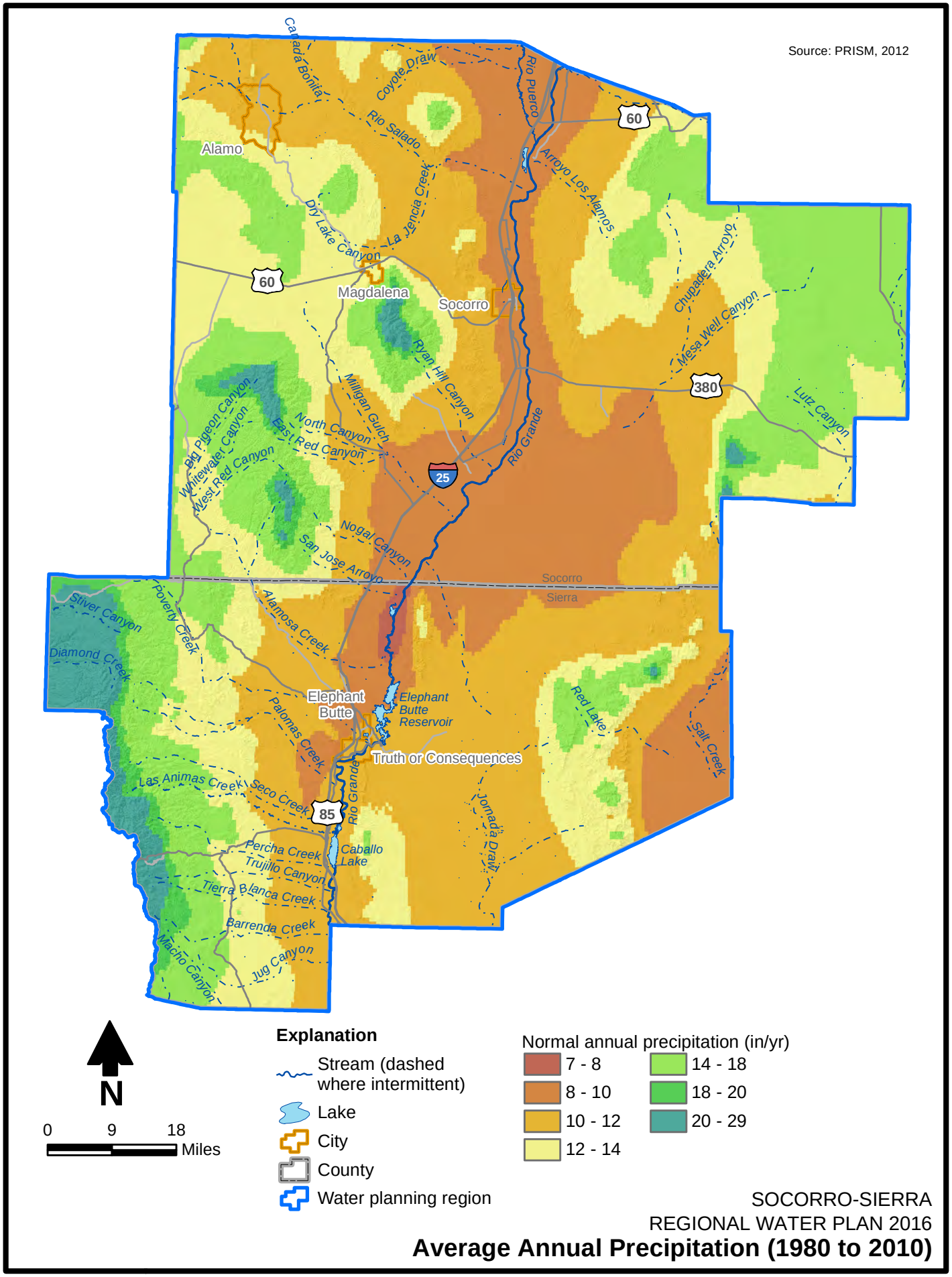

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Average Annual Precipitation (1980 to 2010)

Figure 5-3

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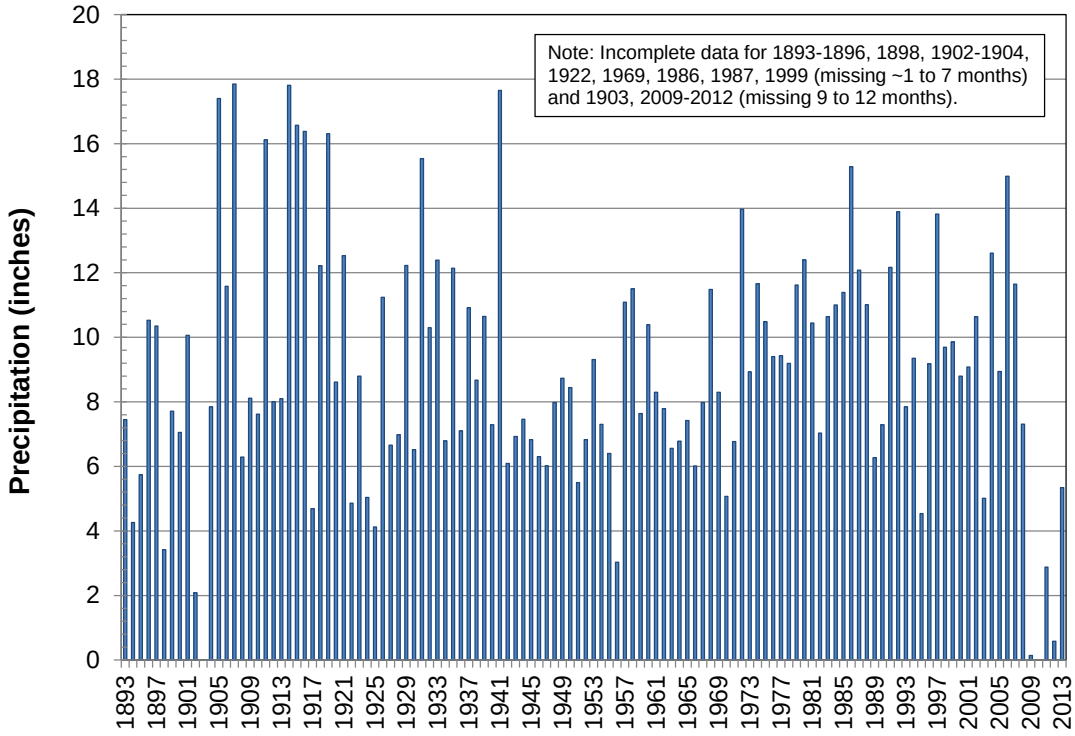
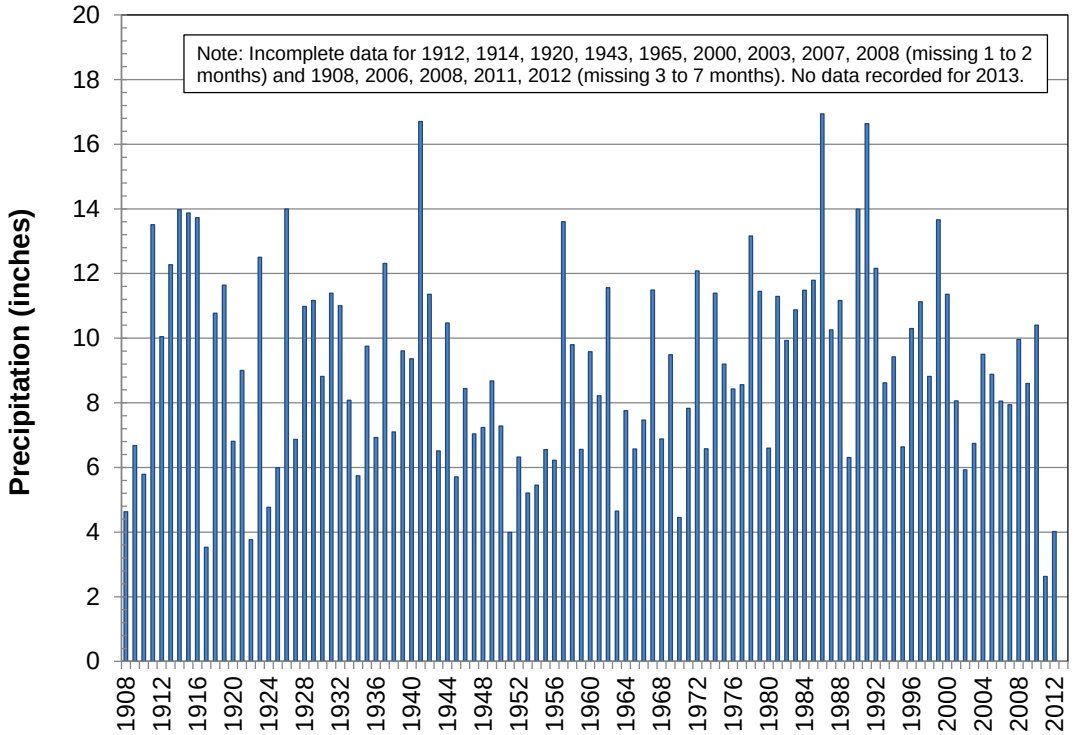
Socorro



Elephant Butte Dam



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Annual Precipitation, Socorro and Elephant Butte Dam Climate Stations

Figure 5-4

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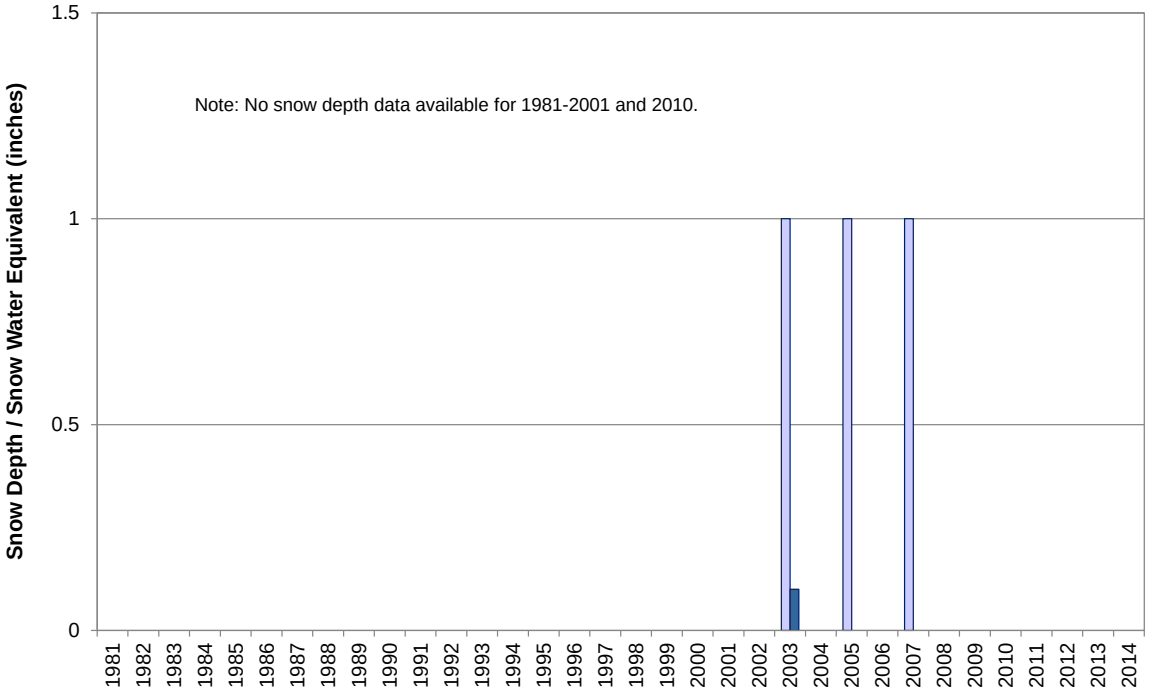
Lookout Mountain SNOTEL



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. (For most years, there was snowpack early in the season, but no snow remained at the beginning of April.)

2. Years with no bars visible are years with zero snow depth in April (unless otherwise noted).

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Snow Depth and Snow Water Equivalent for April

Figure 5-5

P:_WR12-165\RWPs_2015-2016\15_TSocorro-Sierra\Fig5-05_Reg 15_SNOTEL.docx 6/29/16

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.

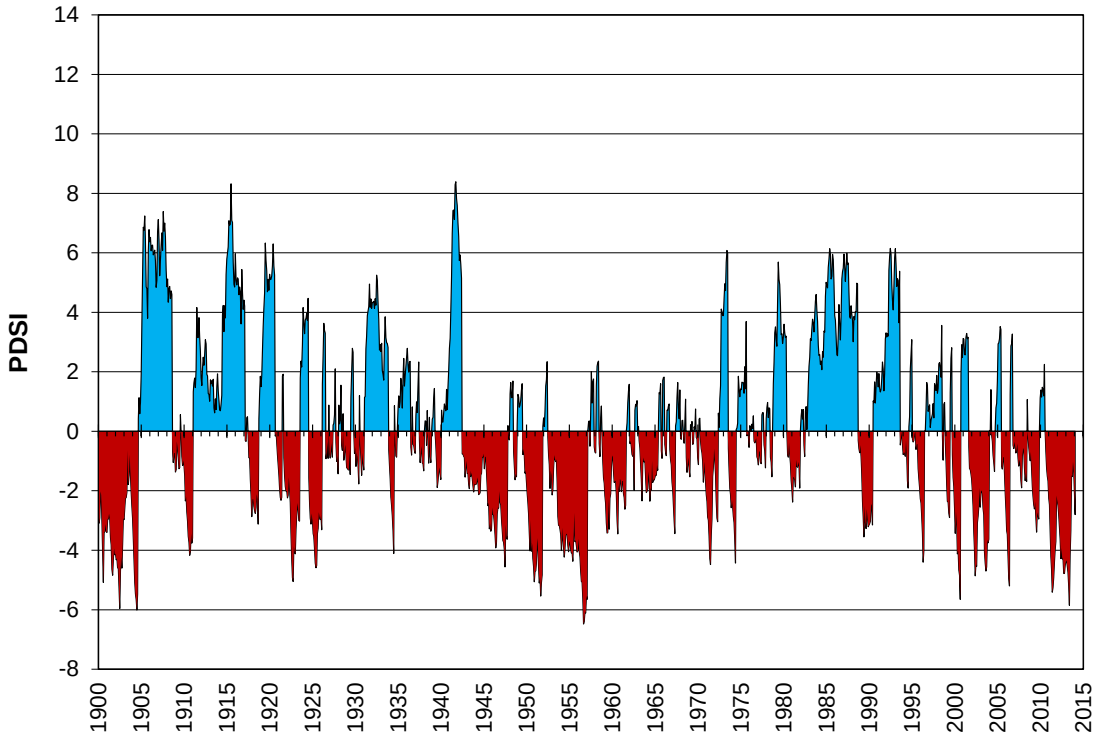
Table 5-3. Palmer Drought Severity Index Classifications

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

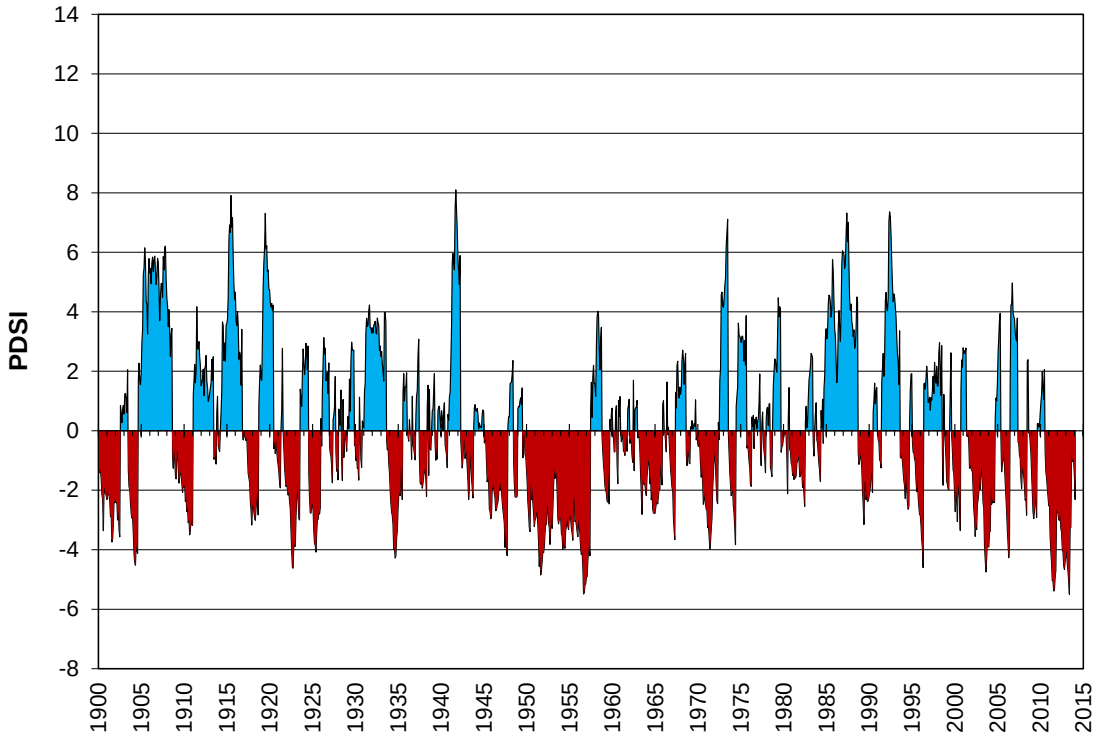
There are considerable limitations when using the PDSI, as it may not describe rainfall and runoff that varies from location to location within a climate division and may also lag in indicating emerging droughts by several months. Also, the PDSI does not consider groundwater or reservoir storage, which 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. There are four climate divisions within the Socorro-Sierra Planning Region: Divisions 4, 5, 6, and 8 (Figure 5-1). The chronological history of drought, as illustrated by the PDSI for these four divisions, 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 5-6a and 5-6b).

Climate Division 4



Climate Division 5



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 4 and 5

Figure 5-6a

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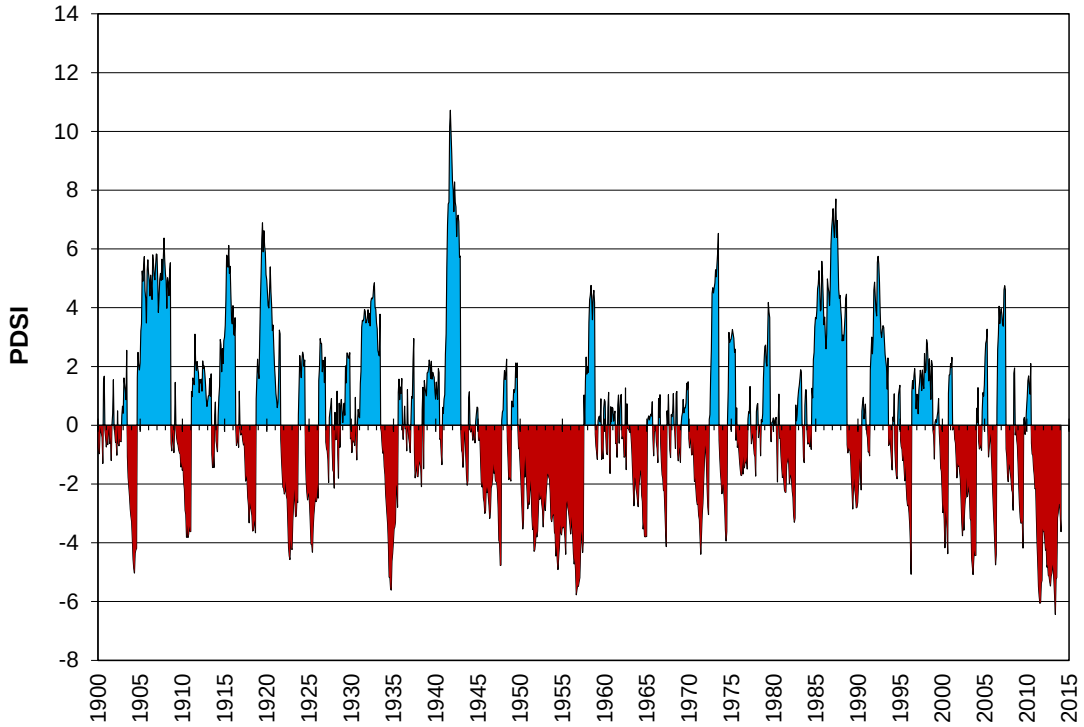
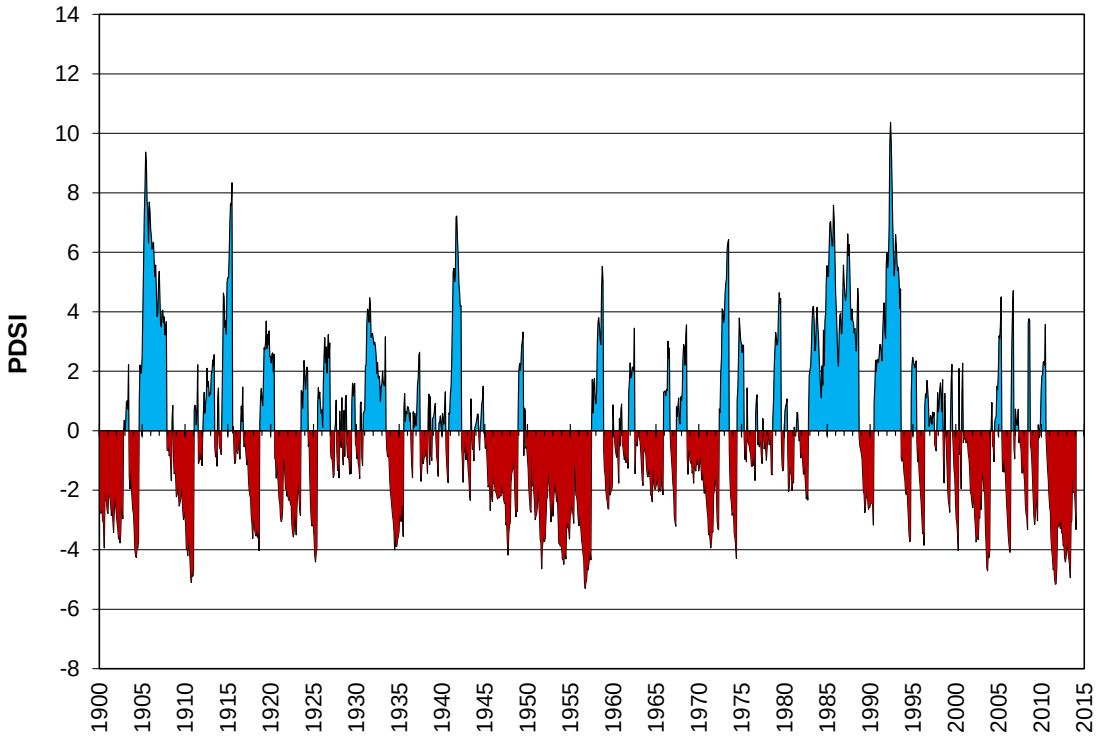
Climate Division 6



Climate Division 8



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 6 and 8

Figure 5-6b

P:_WR12-165\RWPs_2015-2016\15_Socorro-Sierra\Fig5-06b_Reg 15_PDSI Div 6&8.docx 6/29/16

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.

- *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.

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.

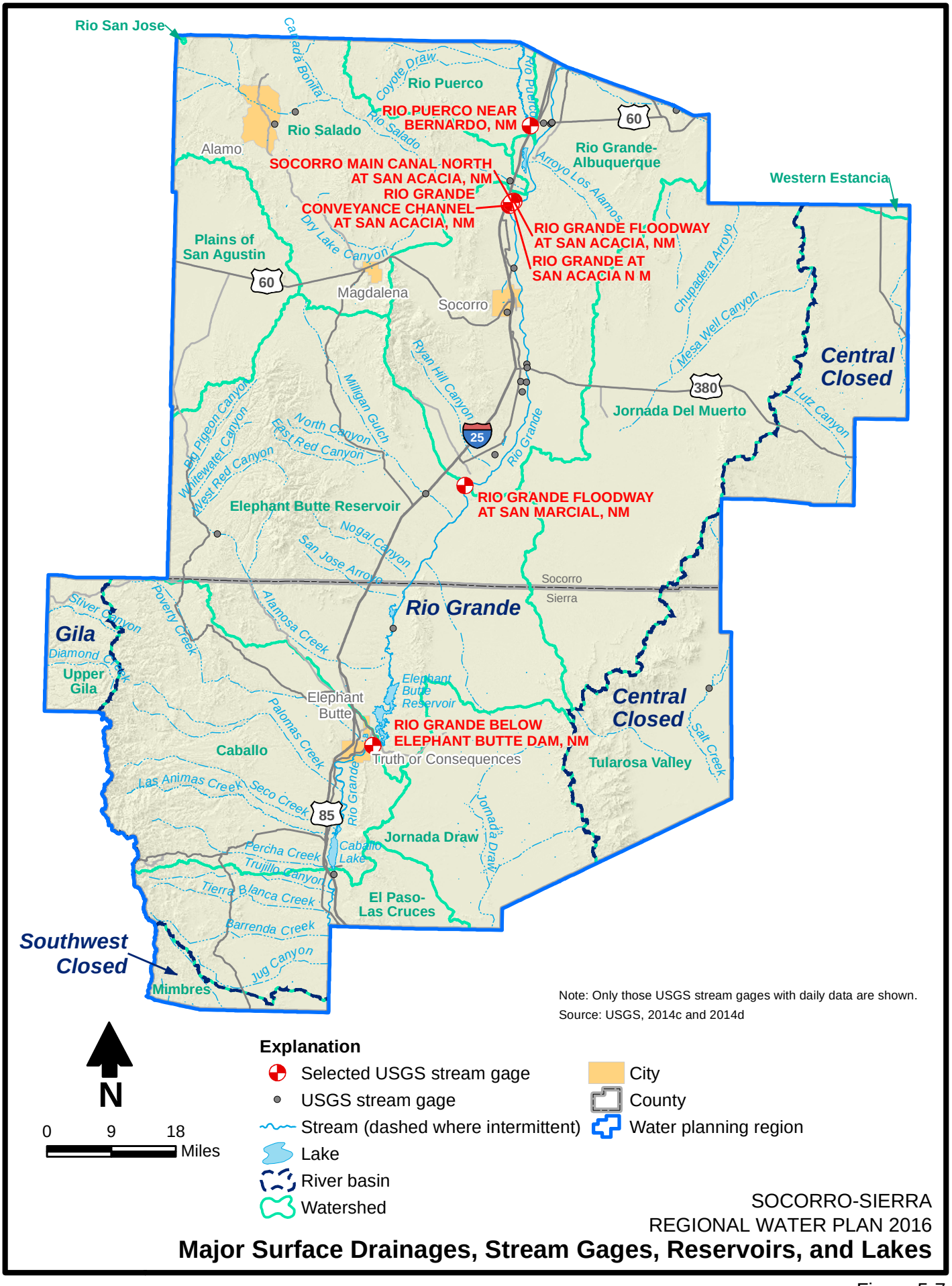
- Reservoir and other open water evaporation are expected to increase. Soil evaporation will also increase.
- Precipitation is expected to be more concentrated and intense, leading to increased frequency and severity of flooding.
- Streamflows in major rivers across the Southwest are projected to decrease 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 et al., 2010). Stress from either of these factors leave forests increasingly susceptible to insects, forest fires, and desiccation. Higher 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 supplies approximately 79 percent of the water currently diverted in the Socorro-Sierra Water Planning Region, with its primary uses being for irrigated agriculture. The dominant waterway flowing in the region is the Rio Grande. Major surface drainages (including both perennial and intermittent streams) and watersheds in the planning region are shown on Figure 5-7, which illustrates that most of the region is part of the Rio Grande river basin. There is also some drainage to the Central Closed basin on the eastern side of the region and a small amount of drainage to the Southwest Closed and Gila basins on the west side of the region (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. This is a particular concern in the Socorro-Sierra region where water right constraints limit water use. 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.



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Major Surface Drainages, Stream Gages, Reservoirs, and Lakes

Figure 5-7

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 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.

When reviewing the stream gage data shown on Tables 5-4a, 5-4b, and 5-5, it should be noted that the Rio Grande flow through the region is divided into flow that goes through the natural channel and flow that goes through the low-flow conveyance channel. The low-flow conveyance channel was completed in 1959 to allow the diversion of some or all of the river's flow into a narrower, deeper, and more hydraulically efficient channel, thereby reducing depletion of the river's flow due to seepage and evaporation through that reach. The gages at San Bernardo, San Acacia, and San Marcial historically recorded flows in both the floodway and the conveyance channel; currently flows are measured in both channels only at San Marcial.

For this water planning update, four stream gages, shown on Figure 5-7 and 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 and 5-9b show the annual water yield from the beginning of the period of record through 2013 for the four gages. As shown in these figures, there is considerable variability between the driest and wettest years, though flows below Elephant Butte are less variable due to reservoir releases. Due to water rights constraints, these yields do not reflect the amount of water that is available for use in the region.

Two large 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]) are present in the planning region (Figure 5-7): Caballo and Elephant Butte. Table 5-6 summarizes the characteristics of these reservoirs. The USBR controls the operation of Elephant Butte and Caballo dams. During the summer months, water is released at Elephant Butte Dam, within certain limits, to generate electricity, and the released water is stored farther downstream behind Caballo Dam until it is needed for irrigation. Little or no water is released from either reservoir during the winter months. While these reservoirs, particularly Elephant Butte, provide important incidental recreational and economic benefits to the region, the majority of the water that is stored in the reservoirs is for the benefit of water users downstream of the Socorro-Sierra region.

Table 5-4a. USGS Stream Gage Stations

Page 1 of 2

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
Socorro County								
Abo Arroyo near Blue Springs, NM	08331660	34.4464537	–106.496685	—	239	—	10/1/1996	9/30/2000
Rio Grande Conveyance Channel near Bernardo, NM	08331990	34.4145092	–106.803637	4,720	—	—	10/1/1952	9/30/2004
Rio Grande near Bernardo, NM	08332000	34.4167314	–106.800581	4,723	19,230	—	6/1/1937	9/30/1958
Rio Grande Floodway near Bernardo, NM	08332010	34.4170091	–106.800581	4,723	19,230	74,000	10/1/1957	Present
Bernardo Interior Drain near Bernardo, NM	08332050	34.4156202	–106.821415	—	—	—	1/1/1954	9/30/2004
Rio Puerco Near Bernardo, NM	08353000	34.4102778	–106.854444	4,722	7,350	11,500	11/1/1939	Present
Alamo Creek near Alamo, NM	08353130	34.4022812	–107.478652	—	—	—	6/24/1983	9/30/1985
Rio Salado near Alamo, NM	08353150	34.4281146	–107.428651	—	—	—	6/23/1983	9/30/1985
Rio Salado near San Acacia, NM	08354000	34.2972883	–106.900306	4,765	1,380	—	10/1/1947	9/30/1984
Rio Grande Conveyance Channel at San Acacia, NM	08354800	34.2484002	–106.901695	4,653	—	—	10/1/1958	9/30/2004
Rio Grande Floodway at San Acacia, NM	08354900	34.2563889	–106.890833	4,655	26,770	760,000 [d]	10/1/1958	Present
Rio Grande at San Acacia NM	08355000	34.253678	–106.896417	4,658	26,770	—	5/1/1936	9/30/1964
Rio Grande at Bridge near Escondida, NM	08355050	34.1208333	–106.886944	—	28,068	718,000	10/1/2005	Present
Arroyo De La Matanza at Socorro, NM	08355300	34.0308994	–106.901694	4,760	46	—	1/1/1969	9/30/1977
Rio Grande Above US Hwy 380 near San Antonio, NM	08355490	33.9266667	–106.851167	—	28,435	718,000	10/1/2005	Present
Rio Grande at San Antonio, NM	08355500	33.9195105	–106.85058	4,542	27,400	—	4/1/1951	6/30/1957

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] Includes 8,600 acres from the Socorro Main Canal North that bypass the gage.

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
Socorro County (cont.)								
Socorro Main C S near San Antonio, NM	08356000	33.8911771	–106.865581	4,526	—	—	10/1/1959	10/6/1971
San Antonio Riverside Drain near San Antonio, NM	08356500	33.890066	–106.851691	4,524	—	—	10/1/1965	10/6/1971
Elmendorf Int Dr near San Antonio, NM	08357000	33.870066	–106.861414	4,519	—	—	10/1/1965	10/6/1971
San Antonio Riverside Drain near San Marcial, NM	08357500	33.7420103	–106.925028	4,487	—	—	10/1/1965	10/7/1971
Rio Grande Conveyance Channel at San Marcial, NM	08358300	33.6876667	–106.992611	4,454	—	NA	12/1/1951	Present
Rio Grande Floodway at San Marcial, NM	08358400	33.6790833	–106.997	4,455	27,700	775,000 [e]	10/1/1949	Present
Rio Grande at San Marcial, NM	08358500	33.6806223	–106.992253	4,455	27,700	—	1/1/1899	9/30/1964
Milligan Gulch near San Marcial, NM	08358550	33.660344	–107.090866	4,720	413	—	7/1/1968	10/2/1978
Alamosa Creek near Monticello, NM	08360000	33.5694444	–107.593333	6,142	403	NA	10/1/1931	9/30/1971
Sierra County								
Rio Grande at Narrows in Elephant Butte Res., NM	08359500	33.3861818	–107.163087	4,364	28,500	775,000	4/1/1951	Present
Rio Grande below Elephant Butte Dam, NM	08361000	33.1485111	–107.206783	4,241	29,450	800,000	10/1/1916	Present
Rio Grande below Caballo Dam, NM	08362500	32.8849111	–107.292697	4,141	30,700	800,000	1/1/1938	Present
Salt Creek near Tularosa, NM	08480595	33.2755556	–106.397222	4,050	763	—	8/31/1995	4/4/2012

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

[e] Includes 13,800 acre-feet diverted from the conveyance channel

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 5-4b. 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	
Socorro County				
Rio Grande Conveyance Channel near Bernardo, NM	1,376	9,267	762,337	40
Rio Grande near Bernardo, NM	152,829	939,709	1,260,426	11
Rio Grande Floodway near Bernardo, NM	39,384	805,051	1,740,417	32
Bernardo Interior Drain near Bernardo, NM	2,266	42,605	75,799	50
Rio Puerco near Bernardo, NM	3,721	20,199	159,273	73
Rio Salado near San Acacia, NM	110	8,289	81,012	36
Rio Grande Conveyance Channel at San Acacia, NM	0	157,970	807,947	45
Rio Grande Floodway at San Acacia, NM	16,000	569,834	2,042,311	40
Rio Grande at San Acacia, NM	152,974	570,776	2,798,856	27
Socorro Main C S near San Antonio, NM	4,728	9,774	14,262	11
Rio Grande Conveyance Channel at San Marcial, NM	0	202,892	831,114	48
Rio Grande Floodway at San Marcial, NM	2,114	410,670	1,562,321	50
Rio Grande at San Marcial, NM	114,170	738,084	2,831,435	52
Alamosa Creek near Monticello, NM	4,648	5,947	9,194	22
Sierra County				
Rio Grande below Elephant Butte Dam, NM	168,757	692,402	1,818,605	97
Rio Grande below Caballo Dam, NM	205,534	651,606	1,395,808	46
Salt Creek near Tularosa, NM	317	680	1,969	16

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
Socorro County													
Rio Grande Conveyance Channel near Bernardo, NM	40	12,997	11,695	10,990	11,102	11,592	9,633	5,541	4,968	3,787	4,799	15,285	14,166
Rio Grande near Bernardo, NM	11	42,416	49,149	47,598	89,577	214,300	158,782	50,978	34,950	26,213	27,576	43,119	48,228
Rio Grande Floodway near Bernardo, NM	32	52,251	53,783	61,192	86,927	157,160	130,692	62,984	29,568	22,547	20,552	52,624	57,257
Bernardo Interior Drain near Bernardo, NM	50	1,716	1,554	3,181	3,797	4,258	3,737	3,971	4,481	4,527	4,720	1,888	1,773
Rio Puerco near Bernardo, NM	73	130	734	951	876	2,190	983	3,647	10,561	5,116	2,637	358	68
Rio Salado near San Acacia, NM	36	0	2	0	5	17	197	1,626	4,813	2,814	811	59	1
Rio Grande Conveyance Channel at San Acacia, NM	45	25,524	23,367	20,822	18,850	27,606	20,078	10,158	8,999	6,339	6,707	29,901	31,454
Rio Grande Floodway at San Acacia, NM	40	43,226	46,137	51,558	79,240	135,575	105,434	52,592	35,563	29,218	22,752	45,194	45,632
Rio Grande at San Acacia, NM	27	42,588	48,155	48,864	85,836	196,346	123,482	46,227	39,212	24,991	25,842	40,989	49,644
Socorro Main C S near San Antonio, NM	11	0	0	1,144	1,350	1,659	1,085	1,053	1,117	1,011	1,049	24	0
Rio Grande Conveyance Channel at San Marcial, NM	48	21,501	19,259	22,900	23,258	27,825	22,940	17,830	15,489	13,377	14,695	24,180	24,995
Rio Grande Floodway at San Marcial, NM	50	32,492	33,990	35,903	54,898	107,485	87,994	40,167	27,606	16,457	12,907	31,520	34,321

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
Socorro County (cont.)													
Rio Grande at San Marcial, NM	52	39,318	43,155	55,317	101,136	236,242	177,890	62,769	42,036	31,519	36,019	34,528	40,655
Alamosa Creek near Monticello, NM	22	434	393	427	413	457	461	616	845	610	461	436	447
Sierra County													
Rio Grande below Elephant Butte Dam, NM	97	17,962	38,488	71,919	89,739	95,111	108,679	105,489	84,591	45,436	19,671	13,366	16,448
Rio Grande below Caballo Dam, NM	46	5,877	15,357	95,491	72,462	78,019	109,612	115,023	97,229	53,066	12,404	2,041	3,404
Salt Creek near Tularosa, NM	16	44	40	36	37	46	37	189	149	128	77	37	49

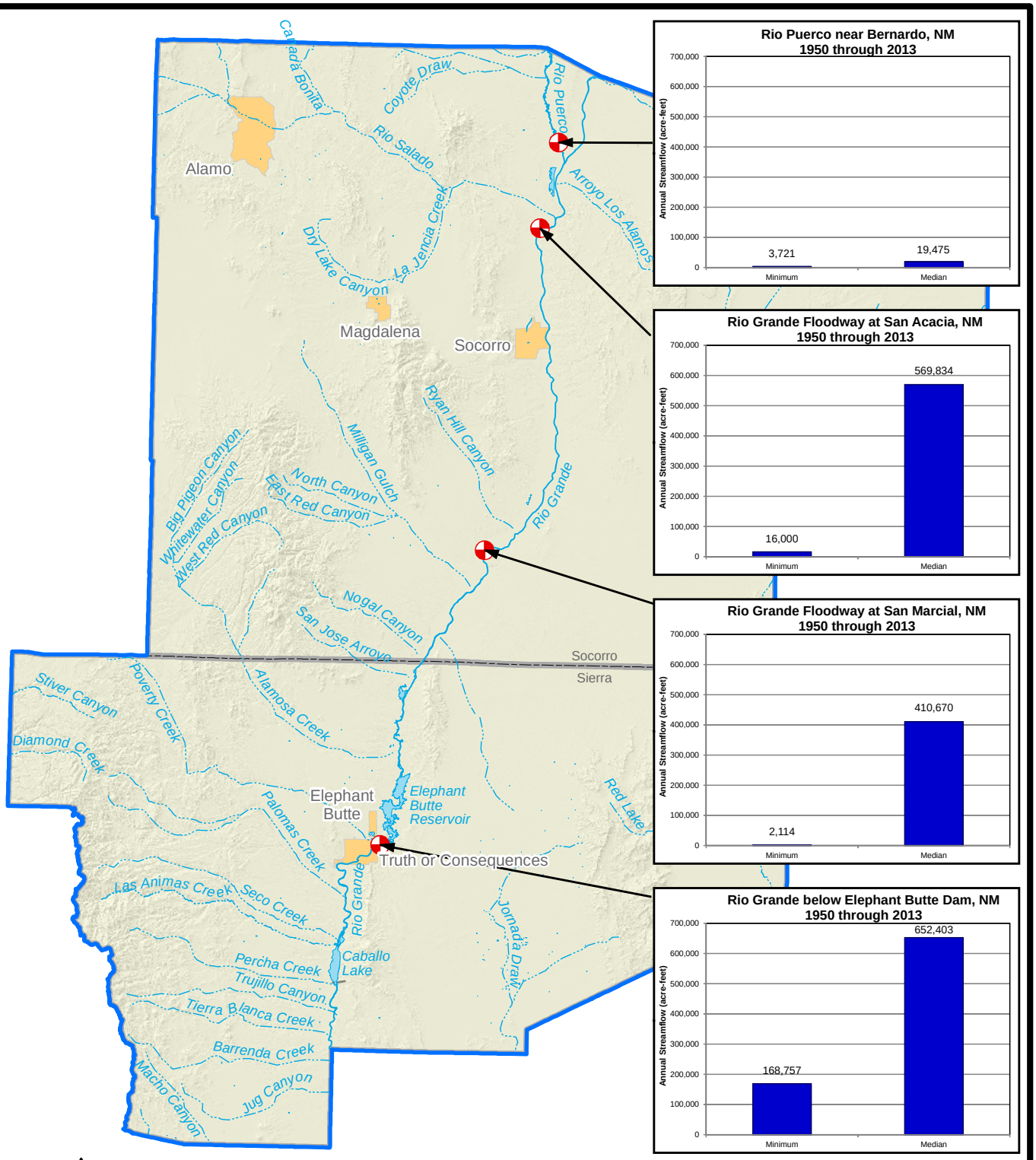
Source: USGS, 2014

[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



Notes:
1. Years with incomplete data were not included in the analysis.
2. Source: USGS, 2014c

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Minimum and Median Yield
1950 through 2013

Figure 5-8

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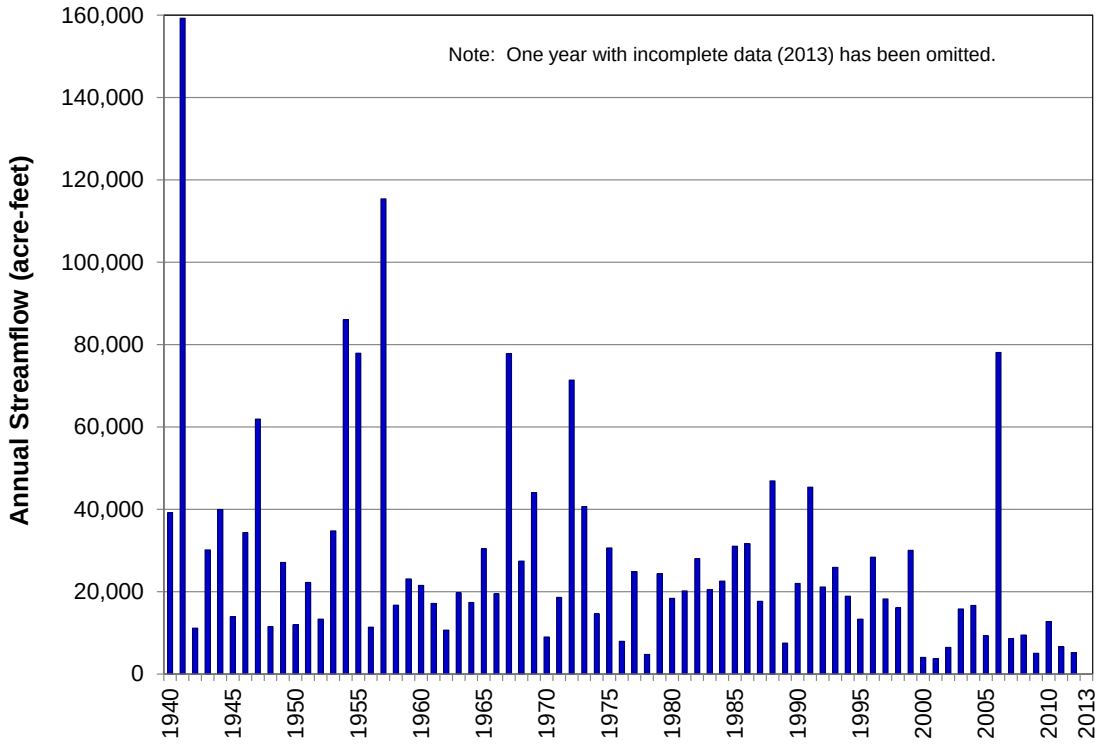
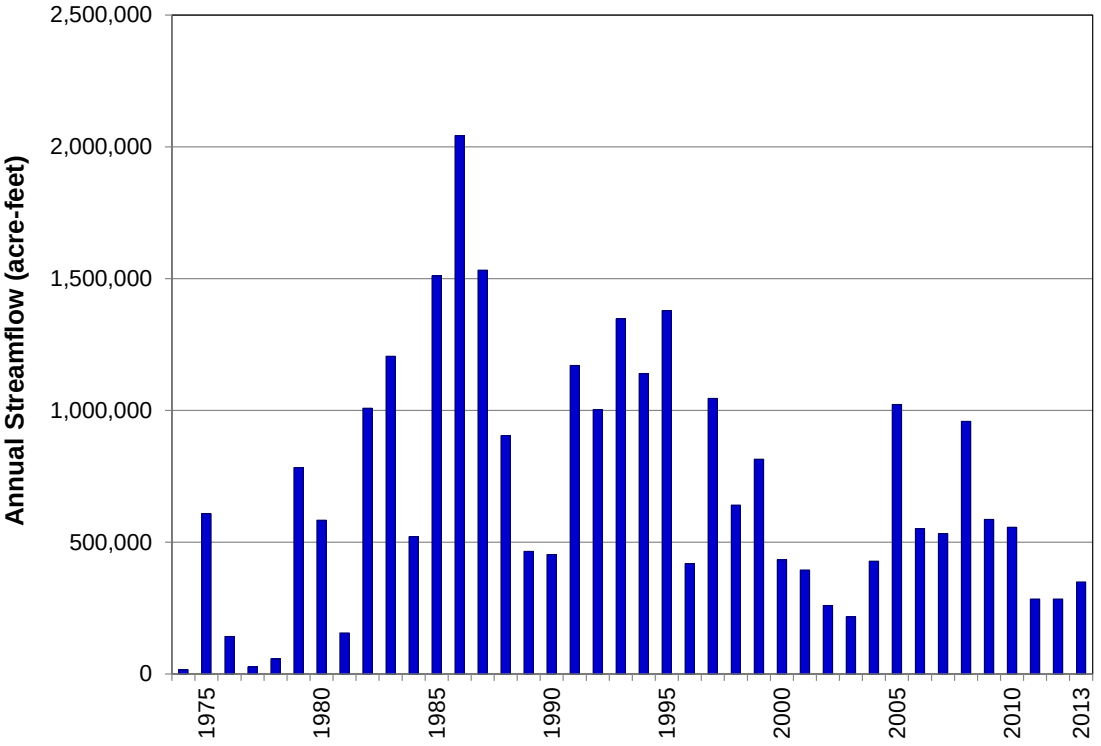
Rio Puerco near Bernardo, NM



Rio Grande Floodway at San Acacia, NM



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Annual Streamflow for Selected Gaging Stations on the Rio Puerco and Rio Grande

Figure 5-9a

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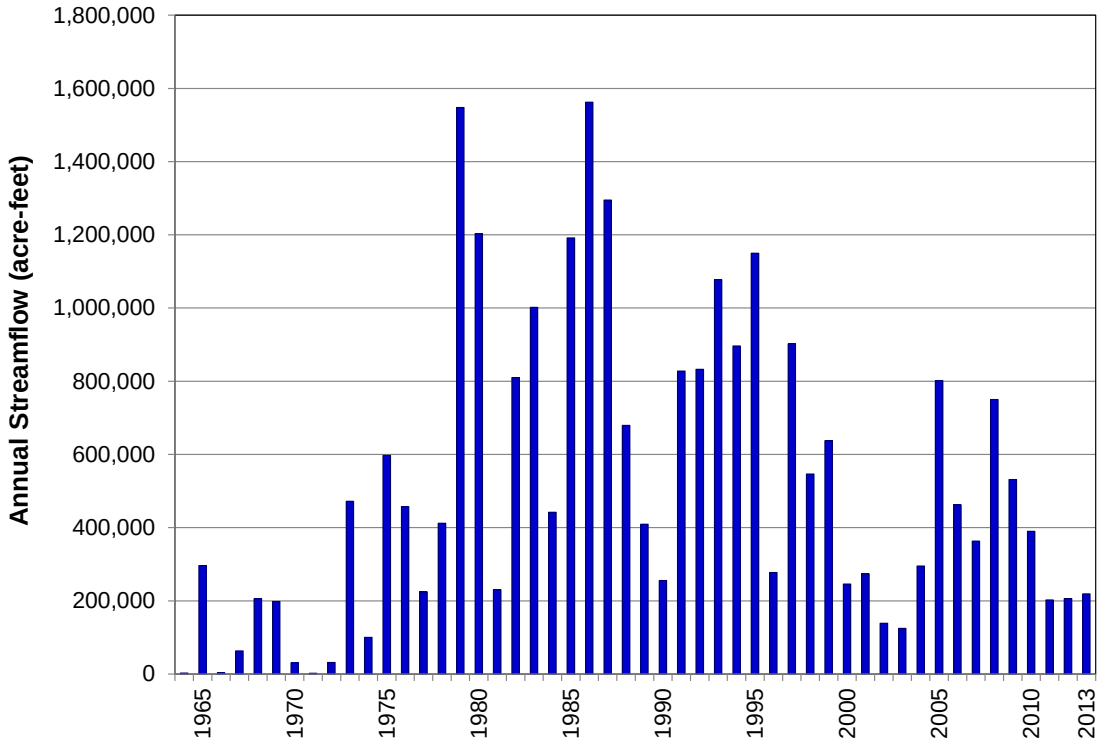
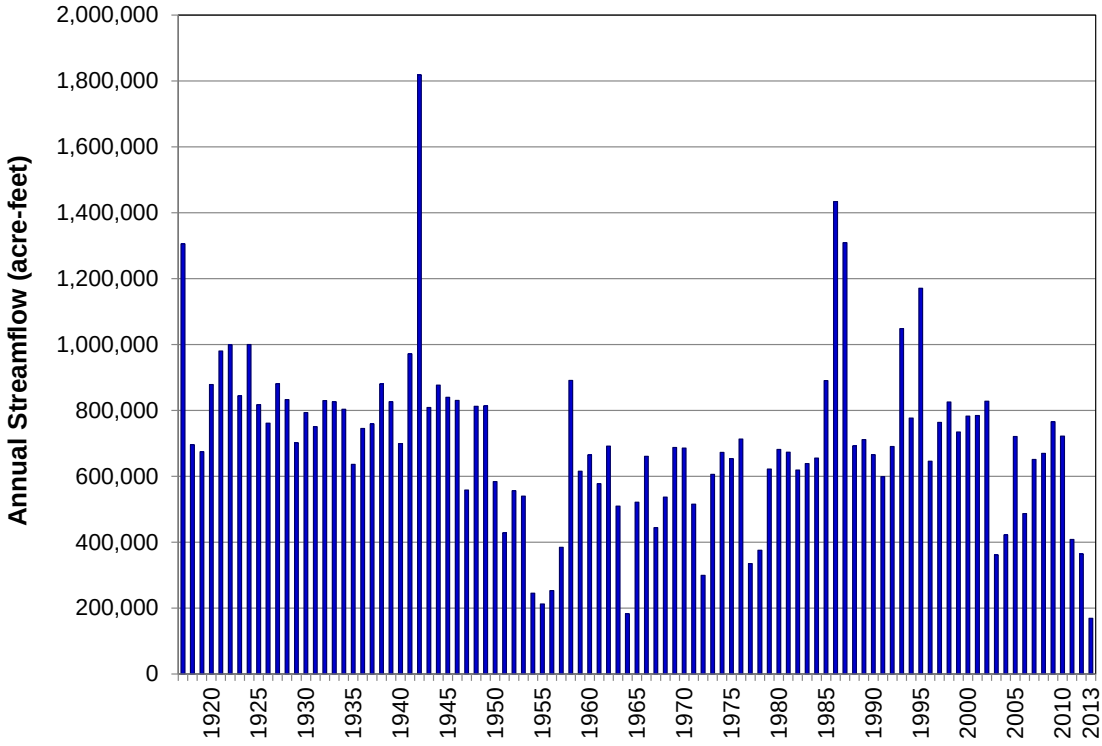
Rio Grande Floodway at San Marcial, NM



Rio Grande below Elephant Butte Dam, NM



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Annual Streamflow for Selected Gaging Stations on the Rio Grande

Figure 5-9b

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Table 5-6. Reservoirs and Lakes (greater than 5,000 acre-feet) in the Socorro-Sierra Water Planning Region

River	Reservoir	Primary Purpose	Operator	Date Completed	Total Storage Capacity (acre-feet)	Surface Area (acres)	Dam Height (feet)	Dam Length (feet)
Socorro County								
Rio Grande	Bosque Del Apache NWR	Wildlife refuge	U.S. Fish and Wildlife Service	1939	—	—	—	—
Sierra County								
Rio Grande	Elephant Butte Reservoir	Conservation storage (irrigation)	Bureau of Reclamation	1915	2,024,586	36,643	301	1,674
	Caballo Reservoir	Re-regulation for irrigation	Bureau of Reclamation	1937	324,934	9,353	96	4,558

Source: USACE, 1999

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. These non-federal dams are ranked as being in good, fair, poor, or unsatisfactory condition. 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. The deficient dams in the Socorro-Sierra region are mostly flood control dams, which do not normally hold water but are available in the event of flooding.

5.3 Groundwater Resources

Groundwater accounted for about 21 percent of all water diversions in the Socorro-Sierra region in the year 2010 (Longworth et al., 2013). Though the majority of the water supply in the region is surface water, groundwater provides important sources for public water systems and livestock wells throughout the region.

5.3.1 Regional Hydrogeology

The geology that controls groundwater occurrence and movement within the planning region was described in the *Socorro-Sierra Regional Water Plan* (DBS&A, 2003), based on studies as referenced in the summary 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.

Five physiographic regions exist within the planning region. From the west to the east, these are:

- Colorado Plateau (Acoma-Zuni Section)
- Datil-Mogollon
- Mexican Highland (Rio Grande subsection)
- Basin and Range (Mexican Highland Section)
- Basin and Range (Sacramento Section)

Figure 5-10 shows the approximate extents of these areas within the planning region.

The primary geologic basins in the planning region were discussed in detail in the 2003 regional water plan. A brief summary of these basins is provided below.

Table 5-7. Dams with Dam Safety Deficiency Rankings

Page 1 of 2

Dam	Condition Assessment [a]	Deficiency	Hazard Potential [b]	Estimated Cost to Repair ($)
Sierra County				
Caballo Arroyo Dam No. 1	Poor	Spillway capacity 34% of required flood Lack of design information	High	2,500,000
Copper Flats Tailings Dam [c]	Poor	Dam has not been maintained and has deteriorated Trees on dam Instrumentation not functional	Significant	3,000,000
County Line Detention Dam	Poor	Lack of design information	High	200,000
Green Canyon Dam	Poor	Lack of design information	High	100,000
Grubstake Tailings Dam	Poor	No maintenance No design information	Low	50,000
Marie Street Dam	Poor	Spillway capacity < 50% of required flood Sewer line penetrating embankment Lack of design information	High	2,500,000
Sibley Green Site 4	Poor	Spillway capacity 65% of required flood Lack of design information	High	2,500,000
Sibley Green Site 5	Poor	Spillway capacity 17% of required flood Lack of design information	High	3,500,000
St. Annes Dam	Poor	Spillway capacity 70% of required flood Lack of design information	High	200,000
T or C Site 8C Dam	Poor	Spillway capacity 65% of required flood Lack of design information	High	2,500,000

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.

[c] The dam is not being actively used for tailings or water storage (Emmer, 2016).

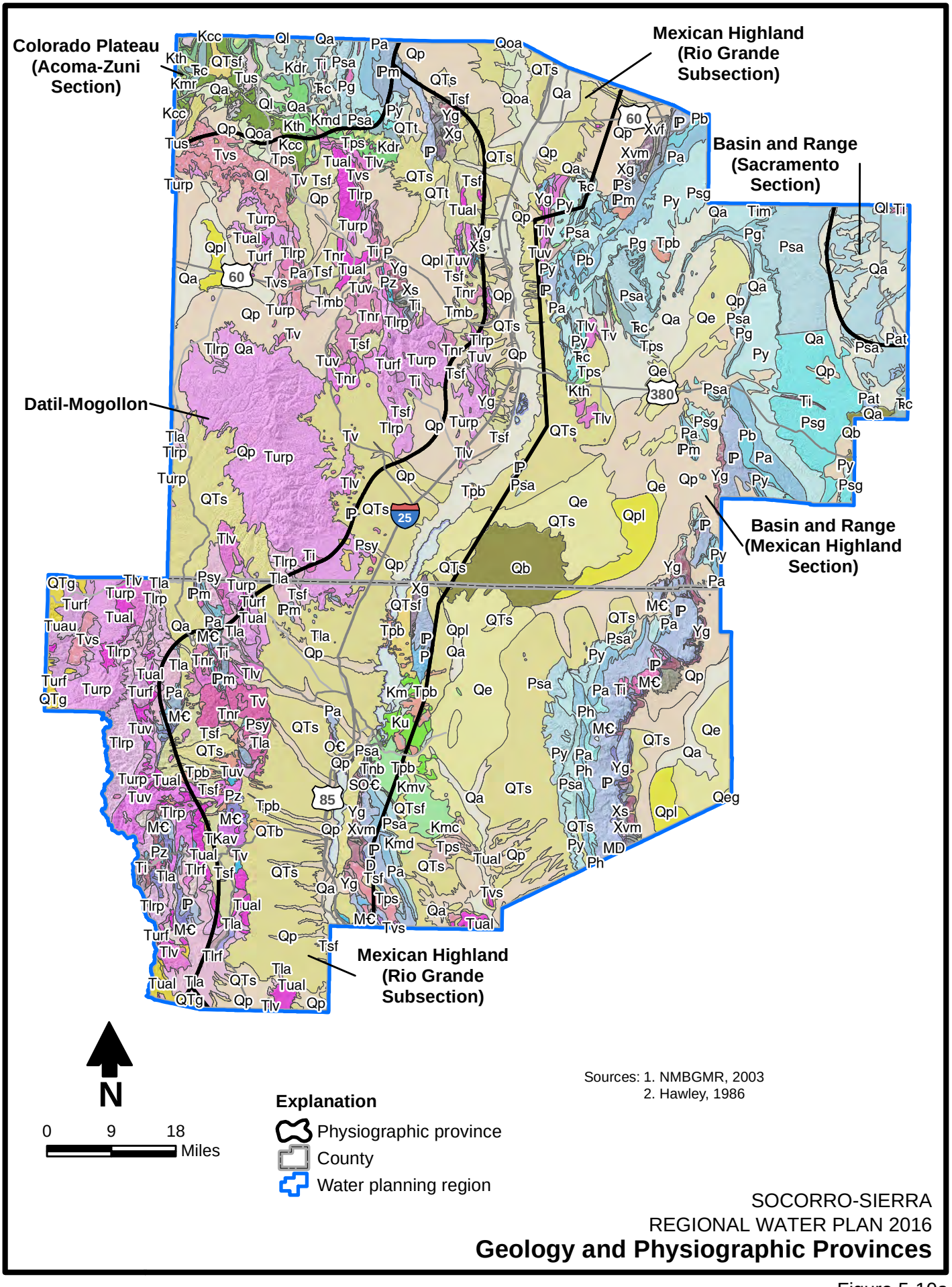
Table 5-7. Dams with Dam Safety Deficiency Rankings
Page 2 of 2

[a] Condition assessment:

	2008 US Army Corps of Engineers Criteria (adopted by NM OSE in FY09)	*NMOSE Spillway Risk Guidelines*
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.
Significant:	Dams where failure or mis-operation would likely not result in loss of human life but could cause economic loss, environmental damage, disruption of lifeline facilities, or could impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but may be located in populated areas with significant infrastructure.
Low:	Dams where failure or mis-operation would likely not result in loss of life but may result in minimal economic or environmental losses. Losses would be principally limited to the dam owner's property


Colorado Plateau (Acoma-Zuni Section)
Mexican Highland (Rio Grande Subsection)
Basin and Range (Sacramento Section)
Datil-Mogollon
Basin and Range (Mexican Highland Section)
Mexican Highland (Rio Grande Subsection)
N
0 9 18
Miles
Explanation
Physiographic province
County
Water planning region
Sources: 1. NMBGMR, 2003
2. Hawley, 1986
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REGIONAL WATER PLAN 2016
Geology and Physiographic Provinces
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Figure 5-10a

Geology Explanation

- IP - Pennsylvanian rocks undivided
- IPm - Madera Group
- IPs - Sandia Formation
- D - Devonian rocks undivided
- K - Cretaceous rocks, undivided
- Kcc - Crevasse Canyon Formation
- Kd - Dakota Sandstone
- Kdg - Dakota Group
- Kdr - Dakota Sandstone and Rio Salado Tongue of the Mancos Shale
- Kgm - Gallup Sandstone and underlying D-Cross Tongue of the Mancos Shale
- Km - Mancos Shale
- Kmc - McRae Formation
- Kmd - Intertongued Mancos Shale and Dakota Sandstone of west-central New Mexico
- Kmr - Rio Salado Tongue of the Mancos Shale
- Kmv - Mesaverde Group
- Kth - Tres Hermanos Formation
- Ku - Upper Cretaceous Rocks of southwestern New Mexico, undivided
- M - Mississippian rocks, undivided
- MD - Mississippian and Devonian rocks, undivided
- M€ - Mississippian through Cambrian rocks, undivided
- O€ - Ordovician and Cambrian rocks, undivided
- P - Permian rocks, undivided
- PIP - Permian and Pennsylvanian rocks, undivided
- Pa - Abo Formation
- Pat - Artesia Group
- Pb - Bursum Formation
- Pg - Glorieta Sandstone
- Ph - Hueco Formation (or Group)
- Psa - San Andres Formation
- Psg - San Andres Limestone and Glorieta Sandstone
- Psy - San Andres, Glorieta, and Yeso Formations, undivided
- Py - Yeso Formation
- Pz - Paleozoic rocks, undivided
- QTb - Basaltic to andesitic lava flows
- QTg - Gila Group, Formation, or Conglomerate
- QTp - Older piedmont alluvial deposits and shallow basin fill
- QTs - Upper Santa Fe Group
- QTsf - Santa Fe Group, undivided
- QTt - Travertine
- Qa - Alluvium
- Qb - Basaltic to andesitic lava flows
- Qe - Eolian deposits
- Qeg - Gypsiferous 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
- Qpl - Lacustrine and playa deposits
- SO - Silurian and Ordovician rocks, undivided
- SO€ - Silurian through Cambrian rocks, undivided
- TKav - Tertiary-Cretaceous andesitic to dacitic lavas and pyroclastic breccias
- TKi - Tertiary-Cretaceous intrusive rocks
- Ti - Tertiary intrusive rocks of intermediate to silicic composition
- Tim - Tertiary mafic intrusive rocks
- Tla - Lower middle Tertiary andesitic to dacitic lavas and pyroclastic flow breccias
- Tlrf - Lower middle Tertiary rhyolitic lavas and local tuffs
- Tlrp - Lower middle Tertiary rhyolitic to dacitic pyroclastic rocks of the Datil Group, ash-flow tuffs
- Tlv - Lower middle Tertiary volcanic rocks
- Tmb - Basaltic to andesitic lava flows
- Tnb - Basaltic to andesitic lava flows
- Tnr - Silicic to intermediate volcanic rocks
- Tpb - Basaltic to andesitic lava flows
- Tps - Paleogene sedimentary units
- Tsf - Lower Santa Fe Group
- Tual - Lower-upper middle Tertiary basaltic andesites and andesites of the Mogollon Group
- Tuau - Upper middle Tertiary basaltic andesites and andesites of the Mogollon Group
- Turf - Upper middle Tertiary rhyolitic lavas and local tuffs
- Turp - Upper middle Tertiary rhyolitic pyroclastic rocks of the Mogollon Group, ash-flow tuffs
- Tus - Upper Tertiary sedimentary units
- Tuv - Upper middle Tertiary volcanic rocks
- Tv - Middle Tertiary volcanic rocks
- Tvs - Middle Tertiary volcaniclastic sedimentary units
- Water - Water
- Xg - Paleoproterozoic granitic plutonic rocks
- Xpc - Paleoproterozoic calc-alkaline plutonic rocks
- Xq - Paleoproterozoic quartzite
- Xs - Paleoproterozoic metasedimentary rocks
- Xvf - Paleoproterozoic rhyolite and felsic volcanic schist
- Xvm - Paleoproterozoic mafic metavolcanic rocks with subordinate felsic metavolcanic rocks
- Yg - Mesoproterozoic granitic plutonic rocks
- Ŧc - Chinle Group

Source: NMBGMR, 2003

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Geology Explanation

Figure 5-10b

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The Rio Grande Basin trends north-south, and the portion included within the Socorro-Sierra Water Planning Region contains the southern portion of the Albuquerque-Belen Basin, the Socorro Basin, the San Marcial Basin, and the Engle Basin (SSPA, 2002a). The primary aquifers include the Upper Santa Fe Group and Quaternary deposits, which together form the shallow aquifer, and the lower part of the Popotosa Formation (Anderholm, 1987, as referenced by SSPA, 2002a). In general, regional groundwater flow is from the upland areas toward the river and from north to south along the Rio Grande Valley. The majority of supply wells are screened in the Quaternary alluvium or in the Santa Fe Group (SSPA, 2002a). To a limited extent, minor aquifers are found in the Tertiary volcanics and other bedrock formations (SSPA, 2002a).

The San Agustin Basin is a topographically closed basin (or bolson) located in Socorro and Catron counties. Approximately 460 square miles of its 2,000-square-mile area are located within the planning region. Myers et al. (1994) describe the San Agustin Basin as a filled graben. By definition, a graben is a deep downthrown block lying between parallel or subparallel faults. The San Agustin graben is structurally complex at depth. Myers et al. (1994) identify three aquifers in the portion of the San Agustin Basin that is located in Socorro County: (1) the shallow upland aquifer, (2) the Quaternary/Tertiary bolson-fill aquifer, and (3) the Datil Aquifer. The Datil Aquifer underlies both the bolson-fill aquifer of this basin and the Alamosa Creek shallow aquifer to the southeast.

La Jencia Basin is a partially closed basin that encompasses approximately 200 square miles west of the Rio Grande Basin in central Socorro County. The primary aquifer in this basin is composed of the Sierra Ladrones and Popotosa Formations of the Santa Fe Group (Anderholm, 1987, as referenced by SSPA, 2002a). Regional groundwater flow is generally eastward. Some wells have been drilled into minor aquifers within the Tertiary volcanics of the Datil Group, Baca Formation, and the underlying Mesozoic and Paleozoic rocks that are located in the highlands at the edge of the basin (Anderholm, 1987, as referenced by SSPA, 2002a). Groundwater within the basin is primarily used for domestic and livestock purposes.

The Alamosa Creek Basin is located in the west-central portion of the planning region. Approximately 300 square miles of the Alamosa Creek Basin's 400 square miles lie within Socorro County, and approximately 5 square miles lie in Sierra County. Its remaining area lies in Catron County. Myers et al. (1994) identified three aquifers of the Alamosa Creek Basin, portions of which are located in Socorro County. These include (1) the shallow upland aquifer in the higher parts of the study area, (2) the Alamosa Creek shallow Quaternary alluvial aquifer, and (3) the deeper Tertiary Datil Aquifer. In general, these aquifers are unconfined although local conditions of confinement may occur (Wilkins, 1986). As noted above, the Datil Aquifer, which underlies the Quaternary alluvial aquifer of this basin, extends northwesterly and also underlies the bolson-fill aquifer of the San Agustin Basin.

The Jornada del Muerto Basin is a north-south trending basin lying east of and parallel to the Rio Grande Valley in the eastern portions of Socorro and Sierra counties. It is more than 120 miles long and ranges in width from 12 to 30 miles; its area is about 2,700 square miles (Conover et al., 1955; Herrick and Davis, 1965). The primary aquifer of the Jornada del Muerto is contained within the Quaternary/Tertiary bolson-fill. Recharge occurs by infiltration of rain or runoff along ephemeral channels on the basin's floor or in alluvial fans along the basin's margins. According to Conover et al. (1955), Jornada del Muerto groundwater discharges to the Socorro and Mesilla basins of the Rio Grande Valley. Groundwater is also discharged by pumpage and by evapotranspiration. Much of the groundwater in this basin is of poor quality.

The Tularosa Basin trends north-south (Figure 4-1) and lies parallel to and east of the Jornada del Muerto. Orr and Myers (1986) report that the basin's total area is 6,500 square miles; however, only two quadrants of the northern portion of the basin, about 950 square miles of total area, lie within the Socorro-Sierra planning region. As with the neighboring Jornada del Muerto Basin, the principal hydrogeologic characteristic of the Tularosa Basin is its scarcity of potable water sources. This basin's most important aquifer, in terms of water quantity, is its bolson-fill, which yields water ranging from good to poor quality. The best-quality groundwater (potable to slightly inferior quality) in this aquifer is limited to a relatively narrow zone near the basin's highland areas (Conover et al., 1955; Orr and Myers, 1986). An associated source of potable groundwater in the Tularosa Basin is found in locally occurring aquifers within alluvial fan sediments at the bases of the highland margins of the basin. At depth, these alluvial fan sediments lie in interfingered relationship with the bolson-fill sediments. These two sources of potable groundwater are clearly related, as groundwater from the alluvial fans provides recharge to the bolson-fill.

Las Animas Creek Basin is an east-west trending basin centered approximately on Las Animas Creek and located in the west-central portion of Sierra County (Figure 4-1). Las Animas Creek is a tributary of the Rio Grande, but its surface waters presently flow to Caballo Reservoir. The basin is approximately 32 miles long and ranges in width from 1 to 7 miles; its area is about 150 square miles (Davie and Spiegel, 1967). The basin is contained in an area of about 135 square miles in the western half of Sierra County. The basin's primary aquifers are located in the Quaternary alluvium along Las Animas Creek, in the Quaternary/Tertiary Santa Fe Group, which was deposited by the ancestral Rio Grande, and in underlying Paleozoic rocks.

The Hot Springs Artesian Basin is located in central Sierra County, bordering the modern bed of the Rio Grande (Figure 4-1). While the Hot Springs Artesian Basin has been declared a groundwater basin by the NMOSE for the purposes of administering rights to the groundwater, it is also part of the Palomas Basin (Wilkins, 1986; Keller and Cather, 1994) and might more appropriately be called a sub-basin of the larger Palomas structural groundwater basin. Groundwater in the Hot Springs Artesian Basin occurs as thermal and non-thermal waters, under both free-flowing artesian conditions and static conditions. The main aquifers of the basin are

the Quaternary/Tertiary Santa Fe Group and the underlying Paleozoic rocks. The non-thermal water is stored in the Santa Fe Group aquifer, and thermal water emerges from the underlying Paleozoic aquifer. Murray (1959) studied the non-thermal artesian conditions near Truth or Consequences, and Summers (1976) includes sections on the thermal groundwater conditions near Truth or Consequences.

The uppermost portion of the Lower Rio Grande Basin is present in the southern portion of the region (Figure 4-1), which includes Elephant Butte Reservoir, Caballo Reservoir, and the upper portion of the Rincon Valley. The Rincon Valley of the Lower Rio Grande Basin is the narrow valley of the Rio Grande from Caballo Dam to Selden Canyon (located downstream of the planning region). The primary aquifer in the Rincon Valley is a narrow band of alluvium that follows the present channel of the Rio Grande. The primary use of groundwater in the northern Rincon Valley is for irrigation.

Very small portions of the Gila San Francisco and Nutt-Hockett basins are present in the far western and far southern portions of the region, but they are not significant resources within this planning region, as most of the use from these basins is in the Southwest New Mexico and Lower Rio Grande planning regions.

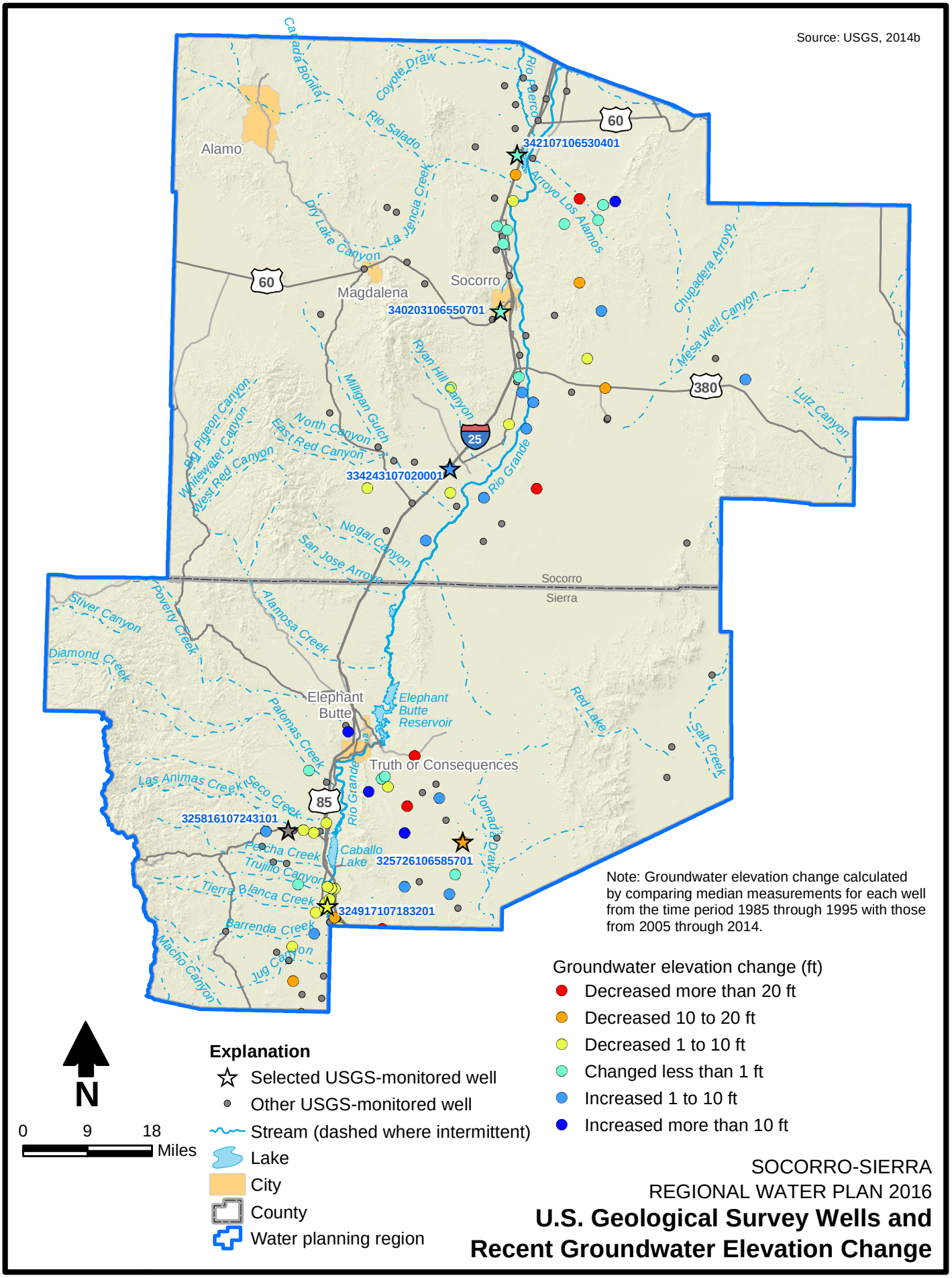
5.3.2 Aquifer Conditions

The accepted regional water plan (DBS&A, 2003) summarized quantitative information on aquifer properties, recharge, groundwater flow, and water levels in the aquifers described above. To provide a current evaluation of changes in water levels over time, data from the USGS, which monitors groundwater wells throughout New Mexico (Figure 5-11), were reviewed. 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 major well fields in the planning region, along with the basins they draw from, are:

- The Town of Socorro well field, which pumps from the Middle Rio Grande Basin
- The Village of Magdalena, which pumps from the Middle Rio Grande Basin
- The Towns of Elephant Butte and Truth or Consequences, which pump from the Middle Rio Grande Basin
- There are also several mutual water users associations, including Polvadera, San Acacia, San Antonio, Caballo Lake, Hillsboro, and Monticello that pump from the Middle Rio Grande Basin

In addition, when surface water supplies are low many farmers in the river valley utilize high-capacity supplemental irrigation wells that pump from the shallow alluvial aquifer.


Source: USGS, 2014b
Alamo
Socorro
Magdalena
Socorro
Sierra
Elephant Butte
Truth or Consequences
Elephant Butte Reservoir
342107106530401
340203106550701
334243107020001
325816107243101
325726106585701
324917107183201
Rio Grande
Rio Puerco
Arroyo Los Alamos
La Jencia Creek
Dry Lake Canyon
Coyote Draw
Rio Salado
Cañada Bonita
Chupadera Arroyo
Mesa Well Canyon
Lutz Canyon
Ryan Hill Canyon
Milligan Gulch
North Canyon
East Red Canyon
West Red Canyon
Whitewater Canyon
Big Pigeon Canyon
Nogal Canyon
San Jose Arroyo
Alamosa Creek
Poverty Creek
Silver Canyon
Diamond Creek
Palomas Creek
Las Animas Creek
Seco Creek
Percha Creek
Trujillo Canyon
Tierra Blanca Creek
Barrenda Creek
Macho Canyon
Jug Canyon
Caballo Lake
Jornada Draw
Red Lake
Salt Creek
60
60
380
25
85
0 9 18 Miles
N
Explanation
Selected USGS-monitored well
Other USGS-monitored well
Stream (dashed where intermittent)
Lake
City
County
Water planning region
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.
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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REGIONAL WATER PLAN 2016
U.S. Geological Survey Wells and Recent Groundwater Elevation Change
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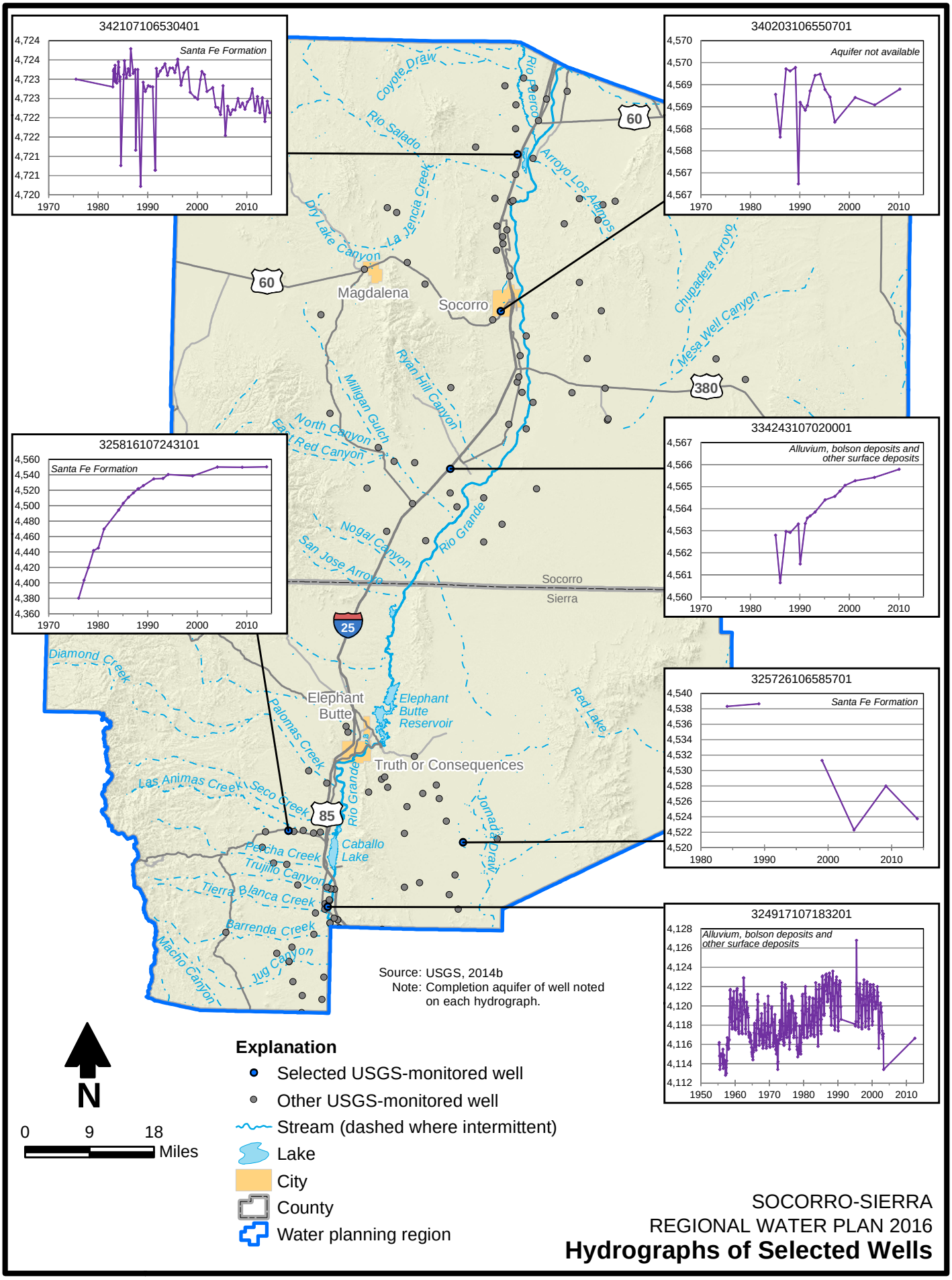
Figure 5-11



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Hydrographs of Selected Wells

Figure 5-12

5.4 Water Quality

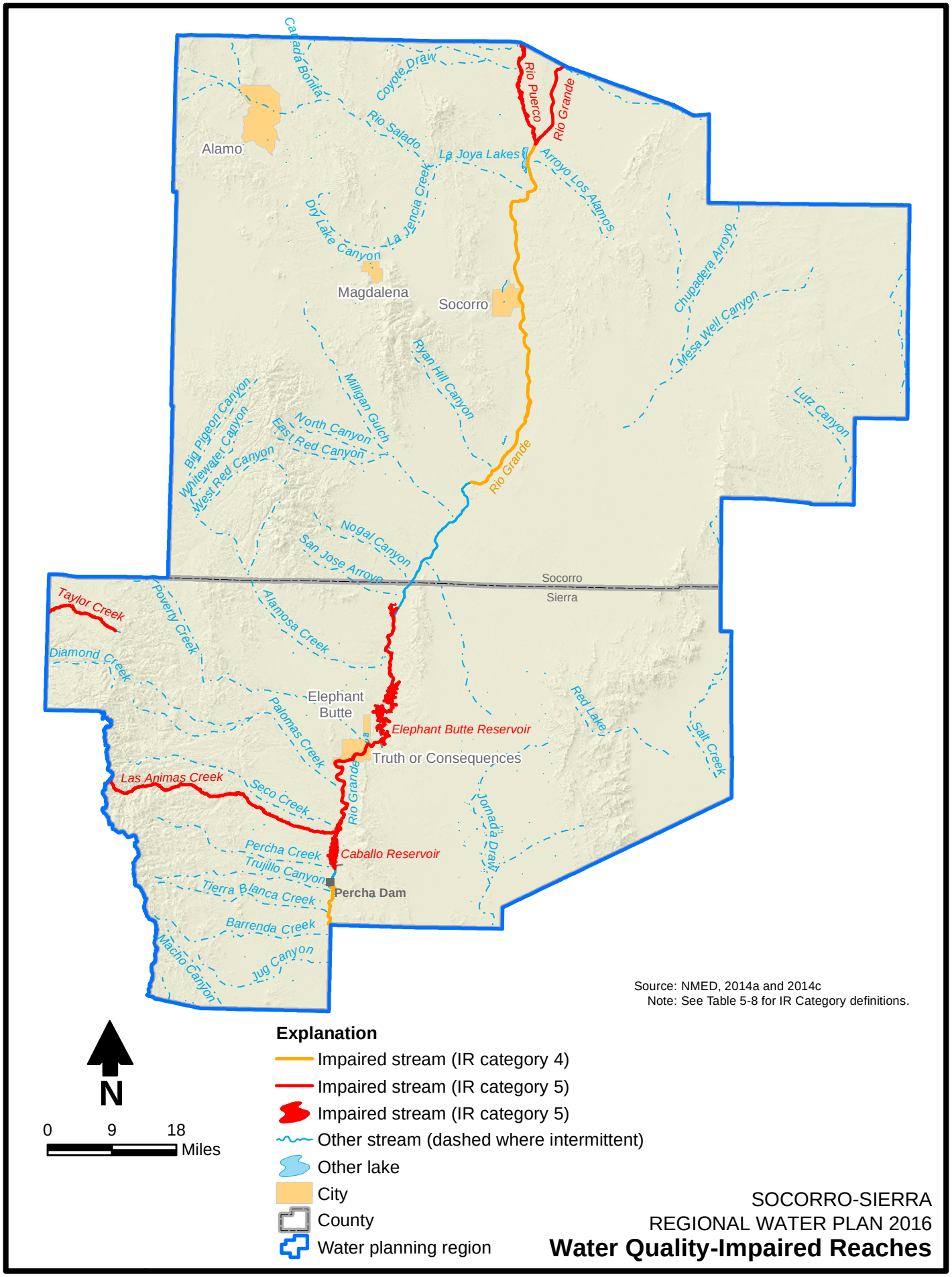
Assurance of ability to meet future water demands requires not only water in sufficient quantity, but also water that is of sufficient quality for the intended use. This section summarizes the water quality assessment that was provided in the 2003 regional water plan and updates it to reflect new studies 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 Socorro-Sierra Water Planning Region is evaluated through periodic monitoring and comparison of sample results to pertinent water quality standards. Several reaches of the Rio Grande and its tributaries and some drainages in outlying parts of the region 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.

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. 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. Mercury in fish tissue is a concern in Elephant Butte and Caballo reservoirs, and polychlorinated biphenyls (PCBs) in fish tissue are also a concern in Elephant Butte Reservoir. The presence of *E. coli* bacteria is the main water quality issue on the Rio Grande, though temperature, dissolved oxygen, and aluminum also caused impairment (Table 5-8). *E. coli* contamination is being addressed by NMED and the Paseo del Norte Watershed Group (IBWC and PDNWC, 2010).

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 of good quality, though elevated salinity is found in the Jornada del Muerto and Tularosa basins, and elevated minerals are found in the Hot Springs Artesian Basin.



Source: NMED, 2014a and 2014c
Note: See Table 5-8 for IR Category definitions.

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Water Quality-Impaired Reaches

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Figure 5-13

Table 5-8. Total Maximum Daily Load Status of Streams in the Socorro-Sierra Water Planning Region

Page 1 of 3

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]
Socorro County						
La Joya Lakes	NM-2103.B_10	166.48 [e]	Not assessed	—	—	3/3A
Rio Grande (Rio Puerco to Isleta Pueblo bnd)	NM-2105_40	35.97	Municipal point source discharges Waterfowl On-site treatment systems (septic) Source unknown Wastes from pets Municipal (high density area) Impervious surface/parking lot runoff	MWWAL PC	Escherichia coli Temperature, water	5/5A
Rio Grande (San Marcial at USGS gage to Rio Puerco)	NM-2105_10	59.61	Municipal point source discharges Waterfowl On-site treatment systems (septic) Source unknown Wastes from pets Municipal (high density area) Impervious surface/parking lot runoff Natural sources	MWWAL PC	Aluminum Escherichia coli	4A
Rio Puerco (non-pueblo Rio Grande to Arroyo Chico)	NM-2105_20	106.58	Source unknown	PC WH	Escherichia coli Mercury	5/5C
Salt Creek (Tularosa Valley)	NM-2801_50	47.13	Not assessed	—	—	3/3A
Sierra County						
Caballo Reservoir	NM-2102.B_00	8230 [e]	Source unknown	WWAL	Mercury in fish tissue	5/5C
Cuchillo Negro Creek (Rio Grande to Willow Spring Draw)	NM-98.A_012	10.3	Not assessed	—	—	3/3A
Diamond Ck (Perennial prt East Fork Gila R to Bailey Ck)	NM-2503_22	13	Not assessed	—	—	3/3A

Source: NMED, 2014a

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

[b] Unless otherwise noted.

[c] 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 Socorro-Sierra 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]
Sierra County (cont.)						
Elephant Butte Reservoir	NM-2104_00	6516.56 [e]	Source unknown	WWAL	Mercury in fish tissue PCB in fish tissue	5/5C
Hoyt Creek (Wall Lake to headwaters)	NM-2503_26	19.95	Not assessed	—	—	3/3A
Las Animas Ck (perennial prt Animas Gulch to headwaters)	NM-2103.A_50	27	Source unknown	MCWAL	Benthic-macroinvertebrate bioassessments	5/5C
Las Animas Ck (perennial prt Rio Grande Animas Gulch)	NM-2103.A_51	12.53	Not assessed	—	—	3/3A
Percha Ck (Perennial prt Caballo Rsvr to Wicks Gulch)	NM-2103.A_21	13.1	Not assessed	—	—	3/3A
Rio Grande (Caballo Reservoir to Elephant Butte Reservoir)	NM-2103.A_00	21.18	Not assessed	—	Oxygen, dissolved	5/5C
Rio Grande (Leasburg Dam to one mile below Percha Dam)	NM-2101_10	42.22	Municipal point source discharges Waterfowl On-site treatment systems (septic) Confined animal feeding operations (CAFOs) Wildlife other than waterfowl Wastes from pets Impervious surface/parking lot runoff Rangeland grazing	PC	Escherichia coli	4A
Salt Creek (Tularosa Valley)	NM-2801_50	47.13	Not assessed	—	—	3/3A
Taylor Creek (Perennial reaches Beaver Creek to headwaters)	NM-2503_23	22.37	Source unknown Silviculture fire suppression Rangeland grazing	HQColdWAL	Nutrient/eutrophication Biological indicators Temperature, water	5/5C

Source: NMED, 2014a

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

[b] Unless otherwise noted.

[c] 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 Socorro-Sierra 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, 2013a) 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 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 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 5/5C: 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.

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/).

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).

5.4.1.2 Remediation Sites

Two sites in the planning region are listed by the U.S. EPA (2014) as Superfund sites. Information regarding these sites is provided in Table 5-11. 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).

Table 5-9. Municipal and Industrial NPDES Permittees in the Socorro–Sierra Water Planning Region

Permit No	Municipality/Industry [a]	Permit Type [b]
Socorro County		
NM0029726	New Mexico Firefighters Training Academy	Other
NM0028835	City of Socorro WWTP [c]	Municipal (POTW)
Sierra County		
NM0031101	Copper Flat Production Well Field [d]	Other
NM0024937	NM State Parks & Rec. Commission/Elephant Butte	Other
NM0030864	Sierra County Regional WWTP - North Area	Municipal (POTW)
NM0020681	City of Truth or Consequences WWTP [c]	Municipal (POTW)

Source: NMED, 2016c

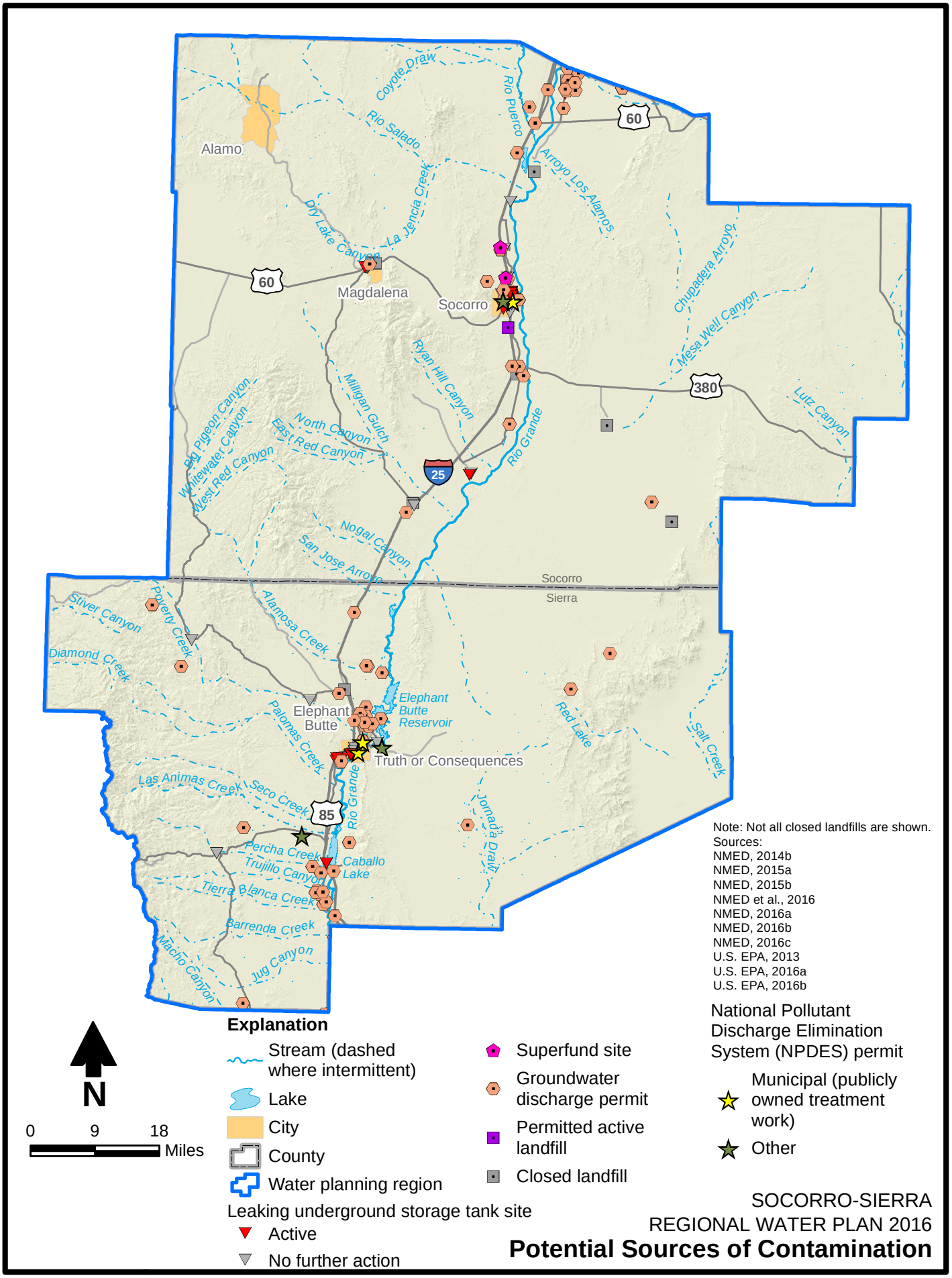
[a] Names appear as listed in the NMED database.

[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] This permit was closed in August 2013. Included in this table only because NM0031101 remains on the NMED website.

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



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Potential Sources of Contamination

Figure 5-14

Table 5-10. Groundwater Discharge Permits in the Socorro–Sierra Water Planning Region

County	Facility Name [a]	Permit No.	Status [b]	Permitted Discharge Amount (gpd)
Socorro	A and M Dairy	DP-563	Active	4,200
	Bosque Dairy	DP-1032	Active	3,000
	Bosque Del Apache National Wildlife Reservation	DP-1753	Active	4,360
	Handley Dairy	DP-1194	Active	6,150
	HAW Farms	DP-1477	Active	7,000
	Jones Dairy Inc	DP-115	Active	18,000
	Kiva RV Park and Horse Motel	DP-1798	Pending	3,850
	La Promesa Elementary School	DP-1285	Active	6,732
	Magdalena (Village of) - Wastewater Treatment Facility	DP-469	Active	50,000
	New Mexico (State of) Firefighters Training Academy	DP-510	Active	225,000
	Othart Dairy 2	DP-772	Active	7,500
	Pareo Dairy	DP-865	Active	11,000
	Roadrunner Travel Center	DP-1291	Active	4,970
	Tres Hermanos Dairy LLC	DP-290	Active	5,000
	UNM Sevilleta Field Station	DP-1622	Active	4,425
Sierra	Agua Vista RV Park	DP-1272	Active	9,000
	Arrey Elementary School	DP-1614	Active	—
	Barrera Dairy	DP-380	Active	25,650
	Caballo Dairy LLC	DP-546	Active	72,000

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

gpd = Gallons per day

— = Not listed on GWQB web site

[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.

Table 5-10. Groundwater Discharge Permits in the Socorro–Sierra Water Planning Region

County	Facility Name [a]	Permit No.	Status [b]	Permitted Discharge Amount (gpd)
Sierra (cont.)	Caballo Lake State Park	DP-334	Active	4,000
	Cedar Cove Mobile Home and RV Park	DP-1253	Active	15,050
	Copper Flat Mine	DP-1840 [c]	Active	25,264,000
	Covarrubias Farms LLC	DP-1776	Active	15,000
	Duran and Sons Chile Products	DP-1750	Active	1,000
	Elephant Butte State Park	DP-328	Active	20,000
	Elephant Butte State Park	DP-835	Active	5,375
	MA and Sons Chile Products	DP-850	Active	45,000
	Mesilla Valley Chili Company	DP-1665	Active	25,000
	Monticello Canyon Subdivision Phase II	DP-1240	Active	3,600
	Monticello RV Park	DP-411	Active	4,650
	Riggs Chili Company Inc	DP-1777	Pending	—
	Sierra County Collection Center	DP-800	Active	9,999
	Sierra County Regional WWTP - North Area	DP-1594	Active	600,000
	Spaceport America	DP-1664	Active	23,250
	St Cloud - 100TPH Concrete Batch Plant NOI 2032	DP-314	Active	0
	Truth or Consequences (City of) - Wastewater Treatment Plant	DP-1162	Active	999,999

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

gpd = Gallons per day

— = Not listed on GWQB web site

[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.

[c] Facility previously regulated under DP-1.

Table 5-11. Superfund Sites in the Socorro–Sierra Water Planning Region

Site Location	Site Name [a]	Site ID	EPA ID	Status [b]
Socorro County				
Near Lemitar, NM	Cal West Metals (USSBA)	604050	NMD097960272	Deleted from NPL
North of Socorro, NM	Eagle Picher Carefree Batteries	600805	NMD001829506	NPL

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

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

[b] NPL = National Priorities List

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 Socorro-Sierra 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 1 operating landfill and 21 closed landfills (Table 5-13).

5.4.1.5 Nonpoint Sources

A common water quality concern in rural areas 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):

Table 5-12. Leaking Underground Storage Tank Sites in the Socorro–Sierra Water Planning Region

City [a]	Release/Facility Name [b,c]	Release ID	Facility ID	Physical Address [c]	Status [d]
Socorro County					
Magdalena	Conoco Dealer	4420	51730	Hwy 60 and Rodeo Rd	Investigation, Responsible Party
Socorro	Caldwell Motor Co	3921	50188	800 N California	Investigation, Responsible Party
	Chevron 75865 Socorro	454	27329	1101 California Northwest	Aggr Cleanup Completed, Resp Party
	Circle K 290	891	1081	805 California	Aggr Cleanup Completed, Resp Party
	Circle W	1771	27381	1104 California Ave	Investigation, Responsible Party
	Electric Coop	50	30665	215 Manzanares NE	Aggr Cleanup Completed, Resp Party
	Jennings Prop	398	27825	900 California	Aggr Cleanup Completed, St Lead, CAF
	Mike's Texaco	2562	31068	1105 California St	Investigation, Responsible Party
	MRGCD Socorro	1302	29506	703 Manzanares NE	Investigation, Responsible Party
	Phillips 66 Soc	845	28401	401 California Northwest	Aggr Cleanup Completed, Resp Party
	Pump N Save 44	4725	30720	508 Hwy 85 SE	Pre-Investigation, Confirmed Release
	Socorro Exxon	4702	31068	1105 California St	Pre-Investigation, Confirmed Release
	Socorro Bulk Plant	4455	54501	716 Bagley St	Investigation, Responsible Party
	Socorro General Hospital	4667	32016	1202 Highway 60 West	Pre-Investigation, Confirmed Release
	Socorro Shell (abandoned station)	744	26357	408 California Ave	Aggr Cleanup Completed, Resp Party
	Sonny's Pump N Save	2172	30671	201 N California St Ne	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 Socorro–Sierra Water Planning Region

City [a]	Release/Facility Name [b,c]	Release ID	Facility ID	Physical Address [c]	Status [d]
Socorro County (cont.)					
Socorro (cont.)	Vagabond Prop/F	346	31434	1015 California Northwest	Aggr Cleanup Completed, Resp Party
	Vagabond/Lube N	859	31433	1013 California	Aggr Cleanup Completed, Resp Party
	Bar F 31 Socor	408	27619	907 N California	Investigation, Responsible Party
	Diamond Shamrock 1295	2784	27619	907 N California	Cleanup, State Lead With CAF
	Former Donut Shop	4691	53765	Unknown	Pre-Investigation, Confirmed Release
	Valley 66 Service Station	4678	53765	Unknown	Pre-Investigation, Confirmed Release
Sierra County					
Elephant Butte	Pat's Bermuda Trngle	2868	29877	1006 Hwy 195	Pre-Investigation, Confirmed Release
Williamsburg	Williamsburg Chevron 2	3169	2025	704 W Broadway	Investigation, Responsible Party
	NMDOT Williamsburg Patrol Yard 41 53	1872	29682	611 Michigan St	Aggr Cleanup Completed, Resp Party
Truth or Consequences	Bell Gas T or C	367	1830	300 North Broadway Street	Aggr Cleanup Completed, St Lead, CAF
	Dixie Truckstop	4578	27745	2450 S Broadway	Investigation, Responsible Party
	Texaco Brdwy	425	27051	901 Broadway St	Cleanup, Responsible Party
	Triangle Conoco	1155	31195	727 Broadway	Aggr Cleanup Completed, Resp Party
Caballo	Caballo Lake Trading Post	3208	27193	Star Rte	Pre-Investigation, Confirmed Release
	Caballo Lake Trading Post	4025	27193	Star Rte	Pre-Investigation, Suspected Release
Arrey	Price-Black Dairy	2245	30050	1 Holstein Lane	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 Socorro-Sierra Water Planning Region

County	Landfill Name [a]	Landfill Operating Status	Landfill Closure Date
Socorro	City of Socorro Landfill (Permitted)	Open	NA
	Fort Craig Landfill	Closed	1990
	La Joya Landfill	Closed	1995
	Lemitar	Closed	1988
	Magdalena C&D	Closed	— [b]
	Magdalena Landfill	Closed	1995
	San Antonio Landfill	Closed	1995
	Veguita Landfill	Closed	1995
	WSMR PHETS C & D Landfill	Closed	— [d]
	WSMR Stallion Range Center Landfill	Closed	— [d]
Sierra	Arrey	Closed	1989
	Cuchillo	Closed	1989
	Derry	Closed	1989
	Elephant Butte	Closed	1987
	Hillsboro	Closed	1989
	Las Palomas	Closed	1989
	Monticello	Closed	1989
	Placitas	Closed	1988
	Sierra County Landfill	Closed	2010
	Truth or Consequences #2	Closed	1985
	Truth or Consequences Landfill	Closed	2015 [c]
	Winston	Closed	1994

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

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

[b] Not yet open as of 2007; closed as of 2014.

[c] Closure plan submitted and approved, final closure construction greater than 80% completed. Final in 2015.

[d] Final closure completed between 2008-2015.

NA = Not applicable

— = Information not available

- 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 areas with shallow water tables. Concentrations of septic tanks and domestic wells near shallow groundwater along the Rio Grande corridor are found in several parts of the region, including the areas south of Belen, near Lemitar, north and south of Socorro, and near Elephant Butte and Truth or Consequences. The domestic wells in these areas generally serve homes that are outside of municipal water and wastewater system service areas, and they have the potential to be impacted by septic tanks. The NMED periodically conducts water fairs at locations around the state, including Socorro, to allow domestic well owners to bring samples of their water to be tested.

Other nonpoint sources of pollutants that are concerns for surface water quality in the planning region include runoff from agricultural activities and erosion and sedimentation from within or upstream of the region.

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. NMED encourages cooperative planning efforts in watersheds where TMDLS are established (https://www.env.nm.gov/swqb/wps/WBP/index.html). Nonpoint source restoration programs in New Mexico are managed by the NMED Surface Water Quality Bureau (2013b). The Paso del Norte Watershed Council recently completed a watershed based plan that addresses bacterial contamination. The watershed area is primarily in the Lower Rio Grande planning region but extends into the southern portion of the Socorro-Sierra region (Paso del Norte Watershed Council, 2014).

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 Socorro-Sierra region, as reported in the *New Mexico Water Use by Categories 2010* report (Longworth et al., 2013), was 303,719 acre-feet. Of this total, 240,515 acre-feet were surface water withdrawals and 63,205 acre-feet were groundwater. The breakdown of these withdrawals among the various sectors 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 four main climate divisions present in the Socorro-Sierra region, the PDSI classifications for 2010 were near normal (Climate Divisions 4, 5, and 6) and incipient wet spell (Division 8). Given that the water use data for 2010 represent a normal to slightly wet 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 Socorro-Sierra region, the gage with the minimum ratio of annual yield to 2010 yield is the Rio Grande at San Acacia. The sum of the yield from both the floodway and the low-flow conveyance channel was used to represent the total flow at San Acacia each year. Based on the region's total administrative surface water supply of 240,515 acre-feet (Section 5.5.1) and the San Acacia ratio of 0.32 for minimum annual yield (211,101 acre-feet in 1964) to 2010 yield (657,960 acre-feet) (USGS, 2014c), the drought-adjusted surface water supply is 76,965 acre-feet. With the 63,205 acre-feet of groundwater supply, the total drought supply is 140,169 acre-feet, or about 46 percent of a normal year administrative water supply.

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 Socorro-Sierra drought supply is not as low as in some regions, because it is tempered by upstream reservoir releases, but in multi-year droughts when reservoirs are low and upstream releases are curtailed, the drought-adjusted supply could be even lower. Nonetheless, the adjusted drought supply provides a rough estimate of surface flows through the region during a severe to extreme drought year. As noted previously, use of Rio Grande water during all years is subject to the terms of the Rio Grande Compact and New Mexico water rights administration.

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 the amount of water withdrawals in 2010 as outlined in the *New Mexico Water Use by Categories 2010* report.
- *Water demand* is based on 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 Socorro-Sierra region was for irrigated agriculture.

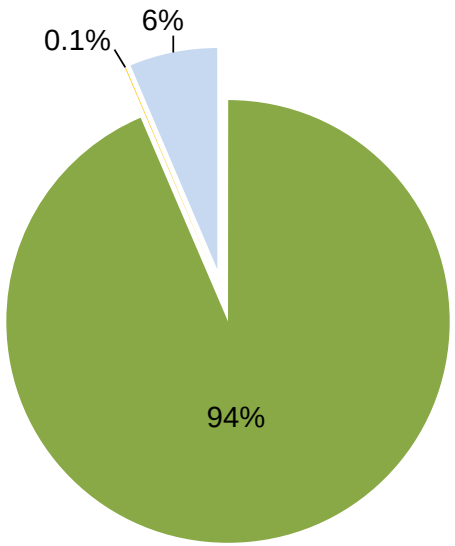
Table 6-1. Total Withdrawals in the Socorro–Sierra Water Planning Region in 2010

Water Use Category	Withdrawals (acre-feet) [a]								
	Socorro County			Sierra County			Planning Region		
	Surface Water	Ground-water	Total	Surface Water	Ground-water	Total	Surface Water	Ground-water	Total
Commercial (self-supplied)	0	1,348	1,348	0	1,709	1,709	0	3,057	3,057
Domestic (self-supplied)	0	356	356	0	168	168	0	525	525
Industrial (self-supplied)	0	51	51	0	0	0	0	51	51
Irrigated agriculture	110,836	30,385	141,221	21,397	23,662	45,059	132,234	54,047	186,280
Livestock (self-supplied)	63	988	1,051	28	536	564	91	1,524	1,615
Mining (self-supplied)	0	23	23	0	17	17	0	40	40
Power (self-supplied)	0	0	0	0	0	0	0	0	0
Public water supply	0	2,294	2,294	0	1,668	1,668	0	3,961	3,961
Reservoir evaporation	7,570	0	7,570	100,620	0	100,620	108,190	0	108,190
Total	118,470	35,444	153,914	122,045	27,761	149,806	240,515	63,205	303,719

Source: Longworth et al., 2013

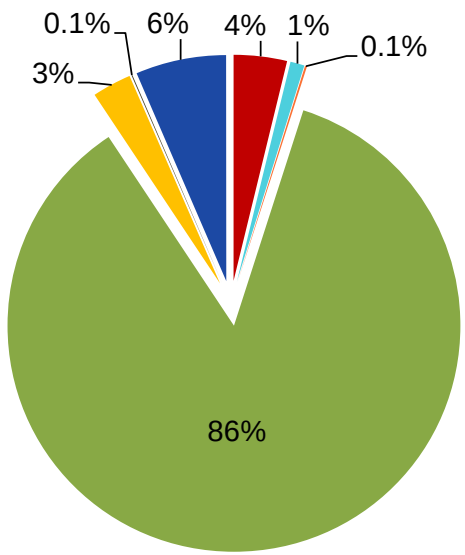
[a] Tribes and pueblos in New Mexico are not required to provide water use data to the State. Therefore, tribal water use data are not necessarily reflected in this table.

Surface Water



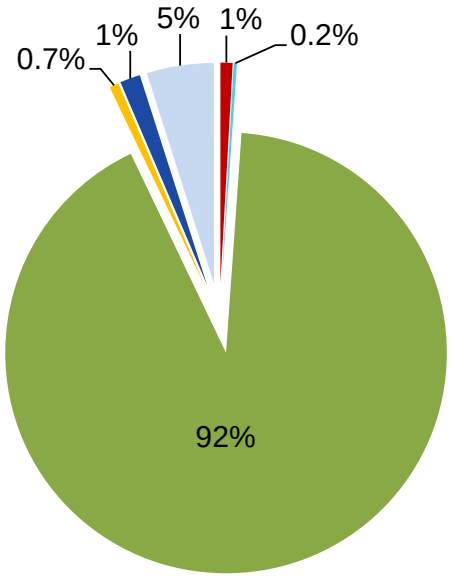
Total usage: 118,470 acre-feet

Groundwater



Total usage: 35,444 acre-feet

Total



Total usage: 153,914 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.

SOCORRO–SIERRA
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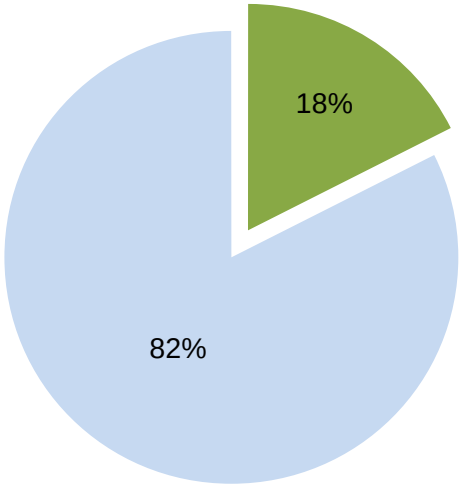
Socorro County Water Demand, 2010

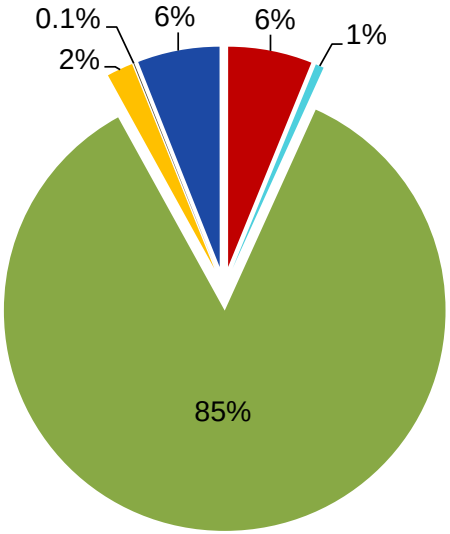
Figure 6-1a

Surface Water



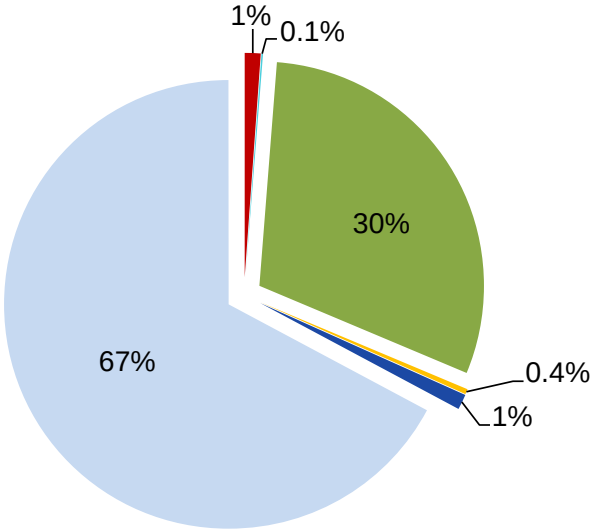
Total usage: 122,045 acre-feet

Groundwater



Total usage: 27,761 acre-feet

Total



Total usage: 149,806 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.

SOCORRO–SIERRA
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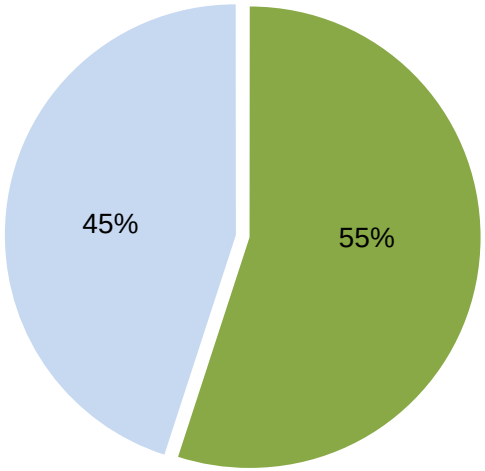
Sierra County Water Demand, 2010

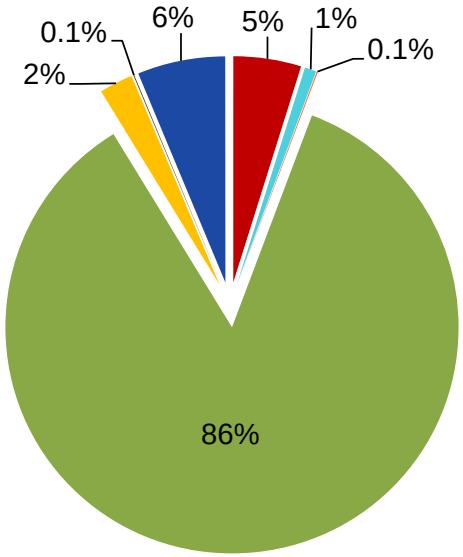
Figure 6-1b

Surface Water



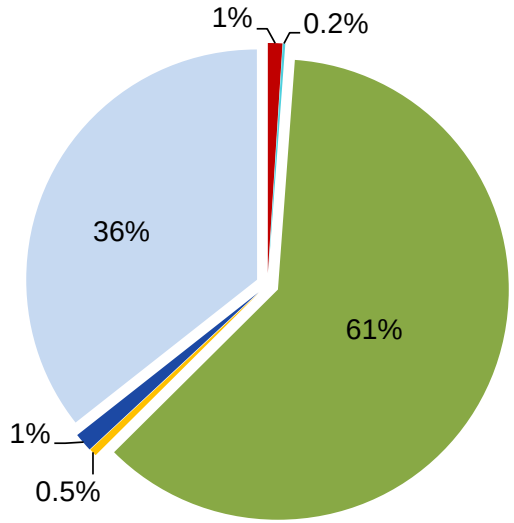
Total usage: 240,515 acre-feet

Groundwater



Total usage: 63,205 acre-feet

Total



Total usage: 303,719 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.

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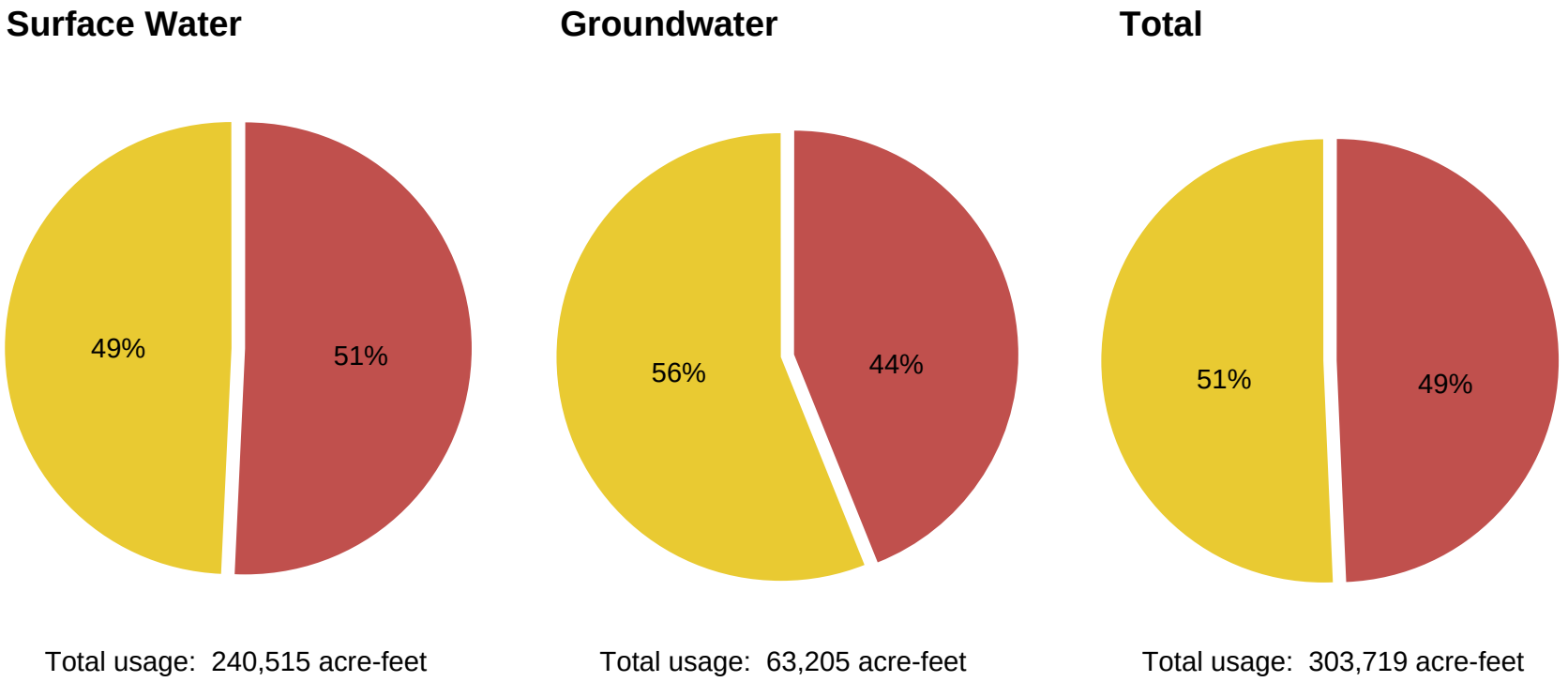
Total Regional Water Demand by Sector, 2010

Figure 6-1c



Explanation

- Sierra
- Socorro

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

SOCORRO–SIERRA
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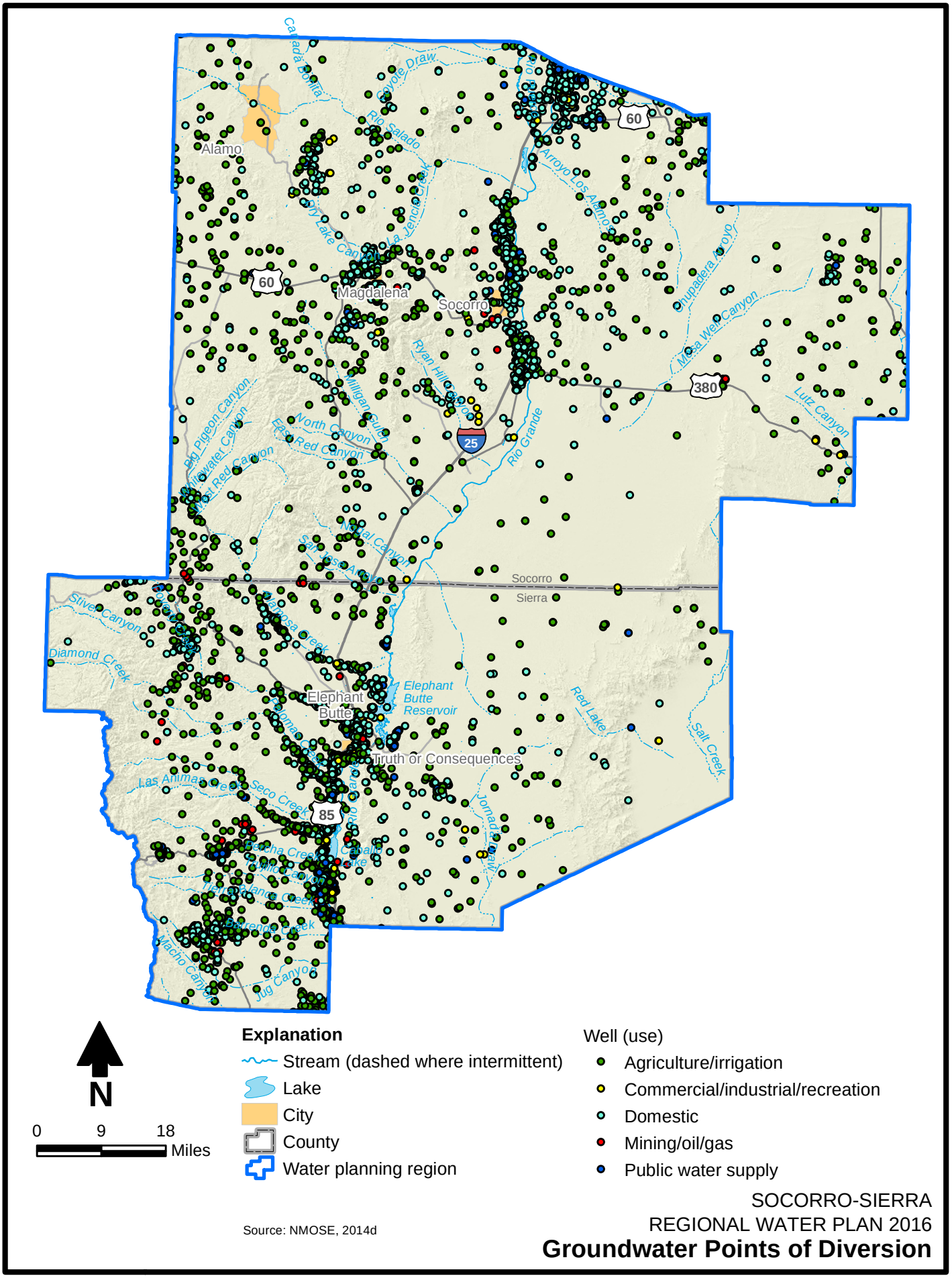
Total Regional Water Demand by County, 2010

Surface water is used largely for irrigated agriculture in Socorro County. In Sierra County, most surface water was used for reservoir evaporation, followed by irrigated agriculture. Riparian vegetation and open water evaporation in the valley of the Rio Grande upstream of Elephant Butte also consume a considerable amount of water. After amendments to Article IV of the Rio Grande Compact in 1948 because of the unreliable nature of measured flows at San Marcial, New Mexico's delivery point was moved from San Marcial to Elephant Butte Dam and Reservoir. Hence reservoir evaporation and riparian evapotranspiration from the area of Elephant Butte Reservoir is borne by the Middle Rio Grande valley, thus impacting the Middle Rio Grande, Jemez y Sangre, and Socorro-Sierra planning regions. Additionally, most of the stored water is for the benefit of downstream users outside of the planning region. However, since the NMOSE tracks the evaporation based on the location of the reservoir, the use is recorded in Sierra County even though the benefits of the reservoir storage are elsewhere.

About 21 percent of the total withdrawals in the region were supplied by groundwater in 2010. Most of the groundwater use in the Socorro-Sierra region is for irrigated agriculture. Groundwater also supplies public water systems, mining, and livestock wells. 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.

- *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 uses, 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.



Source: NMOSE, 2014d

SOCORRO-SIERRA
REGIONAL WATER PLAN 2016

Groundwater Points of Diversion

Figure 6-2

S:\PROJECT\SWR12.0165_STATE_WATER_PLAN_2012\GIS\MXD\SFIGURES_2016\SOCORRO_SIERRA\FIG6-2_POINTS_OF_DIVERSION.MXD 6/18/2016

- *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 withdrawal data for planning purposes will add a margin of safety; thus the use of withdrawal 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. The 2013 populations of Socorro and Sierra counties were 17,584 and 11,572, respectively (U.S. Census Bureau, 2014a). As shown in Table 3-1a, both counties experienced population declines from 2010 to 2013. Leaders in the region were hopeful that by 2014 they would experience an economic uplift from the Spaceport America facility located in Sierra County. However, that has not come to fruition because the space flights are behind schedule and just a few hundred temporary construction jobs have materialized thus far.

As noted in Table 3-1d, milk from cows is the most valuable agricultural commodity in Socorro County, and livestock, poultry and products, the most valuable in Sierra County. A land use map was included in the 2003 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 and 6.2.2. 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 two 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 Socorro County

The 2013 population of Socorro County was 17,584. The City of Socorro, with a 2013 population of 8,911, contained 51 percent of the Socorro County population. Both the County and City experienced a 1.6 percent population decline from 2010.

Most residents are of retirement age and the area is attracting retirees from other states. However, Socorro has difficulty keeping younger people, especially college graduates, because of the lack of employment opportunities. Qualified young people often leave the area to find work in other counties.

Socorro County is home to New Mexico Institute of Mining and Technology (New Mexico Tech), which offers associates, bachelors, masters, and doctoral degrees in science and engineering. In 2014 enrollment was 2,134. A new dormitory was recently completed and a new chemistry lab is under construction with an anticipated completion date of early 2017. Enrollment is expected to remain stable. About 50 percent of graduates leave the state.

Socorro is near many tourist attractions, including the Very Large Array Radio Observatory, Bosque del Apache Wildlife Refuge (a haven for bird watching), and many hiking trails. The city often experiences floods, and a drainage project in downtown has addressed that problem.

The Village of Magdalena ran out of water during the summer of 2013 when the water level in the town's only drinking well dropped below the well's intake. Infrastructure degradation, drought, and mismanagement all contributed to the failure. Potable water had to be trucked into the community. The water shortage occurred at the height of tourist season, and several events had to be canceled. Some local establishments, including the town's grocery store, went out of business as a result, and some residents have left. The State paid for a new well for the community, which in 2013 had a population of 926 (U.S. Census Bureau, 2014a).

The population has shifted from the southern part of the County to the north. Residents are leaving farming and ranching for non-farm jobs in Valencia and Bernalillo counties. Residing in northern Socorro County offers a lower cost of living in exchange for a moderate commute.

Except for a Family Dollar store, no new retail establishments have been built in the City of Socorro since the Walmart store, which was constructed eight years ago. A few galleries have opened, but there has been no major retail or manufacturing development.

Gross receipt tax revenues in the County have been stable because of highway projects on Interstate highway 25 (I-25) and railroad expansion. No new residential building permits have been issued in the past few years.

The population of the County is aging, with most residents over 50 years of age. The County is studying the feasibility of building an assisted living facility and bringing in an operator.

Bankers and realtors in the Socorro area reported that both the residential and commercial loan markets are slow. There is a large inventory of homes on the market. Also, many of the people in the County do not qualify for loans because of poor credit, low incomes, or self-employment.

Most farmers in Socorro County have small acreages and are unable to scale up because of the difficulty of getting loans. Ranchers are suffering because in recent years there has been little

hay to feed their cattle; even though hay is produced locally, some dairies in the state contract with local Socorro farmers to buy all the hay and alfalfa. Socorro County is home to eight dairy producers that are expected to continue production through the forecast period.

In 2012 there were 704 farms and ranches in Socorro County, an increase of 31 percent over 2007; 96 percent of the acreage was in pastureland. There were 1,271,368 acres in farms, a decline of 11 percent from 2007, when there were 1,429,970 acres in farms. The average size of a farm or ranch decreased by almost 32 percent, from 2,666 acres to 1,806 acres, from 2007 to 2012. The number of farms with less than 10 acres more than doubled. Farms of this size are usually hobby farms. Between 2007 and 2012, irrigated acreage grew from 14,815 acres to 18,906 acres, an increase of almost 28 percent. The average age of a farmer was 60.2 years, and there were only 13 producers under 34 years of age (USDA NASS, 2014).

The number of farms participating in agricultural support programs increased from 35 in 2007 to 65 in 2012, and the average amount paid to each of these 65 farms during the time period increased 183 percent, from $8,108 to $22,967. Overall, government payments in Socorro County increased 448 percent, from $284,000 in 2007 to $1,539,000 in 2012. Average sales per farm were $7,714 in 2012; 48 percent of farms had sales of less than $5,000 (USDA NASS, 2014).

6.2.2 Sierra County

The 2013 population of Sierra County was 11,572, a decline of 3.5 percent from 2010. The population of Truth or Consequences in 2013 was 6,246, also a decline of 3.5 percent from 2010. The City of Elephant Butte experienced a 3.3 percent population decline from 2010 to 2013, dropping from 1,431 residents to 1,382 (U.S. Census Bureau, 2014a).

Sierra County is dependent on revenues from tourism at Elephant Butte Lake State Park. However, the water levels in Elephant Butte Reservoir have been too low in recent years to attract a substantial number of visitors. Fishing, boating, camping, and hiking are primary uses of the park, but much of the water from Elephant Butte is set aside for irrigation for agriculture. Reservoir levels dropped to about 3 percent of capacity in 2013, reaching a nearly 50-year low point.

In 2013 tourism-related retail businesses in the City of Elephant Butte suffered declines in revenue. Some have shut down. Gross receipts revenues in the City dropped 9.6 percent. The area received a lot of bad press coverage in 2013 because of the low water levels and spent a good deal of time in 2014 correcting the image of the reservoir as being empty. The City and the State are putting more money into advertising and promotion to attract tourists back to the area.

The economy of the City of Elephant Butte is almost entirely reliant on the reservoir. It was hoped that the proximity of Spaceport America would diversify the economy. As the clientele

for the Virgin Galactic spaceship rides are very high-income individuals, the towns of Elephant Butte and Truth or Consequences have been encouraged to pursue high-end boutique hotels and fine dining restaurants. This is challenging, because there is no infrastructure for these establishments. Construction of a sewer line was initiated in Elephant Butte in 2014. Both cities raised their gross receipt tax rate by a small percentage to support the Spaceport, but it is not enough to fund all the new infrastructure. The City is trying to lure businesses that are not tourism related, and some service contractors in the area are getting business from the Spaceport.

The Turtleback Mountain Resort Development in Elephant Butte has 1,400 residential units approved, but to date only 40 units are occupied. Since 2010 the community, which incorporates a world-class golf course, has been severely impacted by recent drought and the economic downturn. No building permit has been issued since 2013.

Both commercial and residential lending in the County was quite muted in 2013 but picked up a bit in 2014.

In 2012 there were 256 farms and ranches, 9 fewer than in 2007. Total acreage dropped by 7 percent, from 1,344,349 acres to 1,250,136 acres. The average size of a farm dropped by 4 percent, from 5,073 acres to 4,883. Nevertheless, irrigated acreage increased by 85 percent from 6,701 acres to 12,416 acres, mostly likely to grow hay for cattle during the drought. Most of the land in farms (97 percent) is devoted to pasture. The average age of a producer in Sierra County is 57.8 years (USDA NASS, 2014).

There are many small farms in Sierra County—especially in the northern part—that are fed by community ditches and acequias. The southern part of the County has larger farms that grow hay and some vegetables.

Government payments to Sierra County farms participating in agricultural support programs increased 885 percent between 2007 and 2012, from $144,000 to $1,418,000. The average amount per farm increased 139 percent, from $6,240 in 2007 to $14,930 in 2012 (USDA NASS, 2014). Land in irrigated farms fell from 365,159 acres in 2007 to 145,665 acres in 2012, a decrease of almost 61 percent.

Hay and related crops were the primary generators of agricultural revenue in 2012, followed by vegetables and potatoes. Livestock sales contributed 55 percent of total agricultural revenue in 2012, and crop sales contributed 45 percent (USDA NASS, 2014).

A proposed copper mine in Sierra County is being reviewed in accordance with the National Environmental Policy Act. The Copper Flat Mine, on federal land, has been closed for years, but the Mac Resources Group Limited proposes to reopen the mine and processing facility. The mine, near Hillsboro, would consist of an open pit mine, flotation mill, tailings impoundment, and waste rock disposal areas. The projected life of the mine is 11 years. The mine would create

about 180 jobs in the area. The Office of the State Engineer would have to grant a permit for water use.

6.3 Projected Population Growth

The population projections for the *Socorro-Sierra Regional Water Plan* encompassed two forecasts, a high and a low, each covering the period from 2000 through 2040. As shown in Table 6-2, both the high and low population forecasts contained in the 2003 regional water plan were overly optimistic with respect to the actual 2010 population. Even the low forecast exceeded the actual 2010 population of the region by nearly 25 percent.

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

County	2003 Regional Water Plan [a]		2010 U.S. Census [b]
	High	Low	
Socorro	21,715	20,980	17,866
Sierra	16,577	16,176	11,988
Total Region	38,292	37,156	29,854

[a] DBS&A, 2003

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

For the population projections through 2060 (Table 6-3), two population forecasts were developed: one based on an optimistic view of the economy for this region over the long-term and one that portrays a more pessimistic picture. The BBER projections (Appendix 6-B) did not anticipate the population declines that occurred between 2010 and 2013. For Socorro County, therefore, the 2012 BBER population projections through 2020 are believed to be too optimistic; conversely, for 2030 and 2040, they appear too pessimistic. For Sierra County, the BBER projection is close to the low projection presented herein. The low population projections incorporate factors that have been affecting New Mexico since 2000, including drought, job losses, and most recently, out-migration, especially of younger residents.

The population projections are detailed in Table 6-3 and summarized by county below:

- Socorro County: The population of Socorro County is projected to decline slightly through 2020 in the high growth scenario, and then grow modestly. In the low scenario, the population will decline at a faster pace than in the high scenario through 2020, but then reverse and show slow growth. The catalyst for the growth will be northern Socorro County becoming a bedroom community for office workers in Valencia and Bernalillo counties, a trend that has already begun and will accelerate as the state's economy improves.

Table 6–3. Socorro-Sierra 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
Socorro	High	–0.06	0.32	0.59	0.37	0.00
	Low	–0.35	0.31	0.17	0.11	0.11
Sierra	High	0.06	0.87	0.66	0.56	0.32
	Low	–0.38	0.49	0.42	0.22	0.08

Source: Poster Enterprises, 2014

b. Projected Population

County	Projection	Population					
		2010	2020	2030	2040	2050	2060
Socorro	High	17,866	17,760	18,340	19,450	20,175	20,175
	Low	17,866	17,250	17,800	18,100	18,300	18,500
Sierra	High	11,988	12,060	13,150	14,050	14,850	15,325
	Low	11,988	11,540	12,120	12,640	12,920	13,030

Source: Poster Enterprises, 2014

- Sierra County: In the high scenario the population of Sierra County is projected to recover from its 2010-2013 decline by 2020, showing a very slight increase. After 2020 the County is projected to experience moderate growth, predicated on Spaceport America becoming a viable economic contributor to the community, the Copper Flat Mine becoming operational, and the Turtleback Mountain development building more homes. In the low scenario, population is projected to not return to the 2010 level until after 2030, due to a more muted economic recovery.

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.

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 Socorro-Sierra region, as identified by the regional steering committee, are provided in Section 8.

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.

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

OSE Declared Groundwater Basin(s) [a]	Water Supplier	Population	Per Capita Use (gpcd)	Withdrawals (acre-feet)	
				Surface Water	Groundwater
Socorro County					
Rio Grande (Middle)	La Joya MDWCA	68	58	0	4
	Magdalena Water Supply System	1,179	169	0	223
	New Mexico Boys Ranch	60	80	0	5
	Polvadera MDWCA	1,600	94	0	168
	San Acacia MDWCA	165	82	0	15
	San Antonio MDWCA	948	117	0	124
	Socorro Water System	9,870	159	0	1,753
	Socorro County public water supply totals	13,890		0	2,294
	County-wide public water supply per capita use		147		
Rio Grande (Middle) Tularosa	Rural Self-Supplied Homes (Rio Grande)	3,976	80	0	356
	Socorro County domestic self-supplied totals	3,976		0	356
	County-wide domestic self-supplied per capita use		80		
Sierra County					
Lower Rio Grande	Caballo Estates Water	25	196	0	5
	Caballo Lake MDWA	47	243	0	13
	Hillsboro MDWCA	167	60	0	11
Rio Grande (Middle)	City of Elephant Butte/Lakeshore Sanitation District	984	95	0	105
	Desertaire Water Company, LLC	57	61	0	4
	Monticello Canyon Domestic Water Cooperative Association	86	57	0	5
	Monticello Mutual Domestic Water Users	64	58	0	4
Hot Springs Artesian	Truth or Consequences	7,200	159	0	1,342

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).

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	Population	Per Capita Use (gpcd)	Withdrawals (acre-feet)	
				Surface Water	Groundwater
Sierra County (cont.)					
NA	Elephant Butte/Caballo MOB	50	207	0	12
	New Mexico Water Service Company/National Utilities Elephant Butte	1,429	104	0	167
	Sierra County public water supply totals	10,109		0	1,668
	County-wide public water supply per capita use		147		
Gila-San Francisco Hot Springs Las Animas Creek Lower Rio Grande Mimbres Nutt-Hockett Rio Grande (Middle) Tularosa	Rural Self-Supplied Homes	1,879	80	0	168
	Sierra County domestic self-supplied totals	1,879		0	168
	County-wide domestic self-supplied per capita use		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).

gpcd = Gallons per capita per day
NA = Information not available

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.

For the Socorro-Sierra region, current per capita use in Socorro County is under 130 gpcd (Table 6-4), so no additional conservation is assumed. Sierra County currently has per capita use between 130 and 200 gpcd (Table 6-4), so their future per capita use is assumed to be reduced to 130 gpcd. In the projections, these reductions are phased in over time.

Self-supplied domestic. Homeowners with private wells can achieve water savings through household conservation measures. These wells are not metered, 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.

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 Socorro-Sierra 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 uses are low in these categories within the region, no additional conservation savings are assumed in the water demand projections.

Reservoir evaporation. In many parts of New Mexico, reservoir evaporation is one of the highest consumptive water uses, and in the Socorro-Sierra region it is the second highest water use. 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 Socorro-Sierra region. The projections of future water demand determined using this consistent method, as applicable, for the Socorro-Sierra 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 Socorro-Sierra 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 demand.

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. 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 Socorro-Sierra Projected Water Demand

Table 6-5 summarizes the projected water demands for each water use category for each of the two 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 the region in both the high and low projections. The total projected water demand in the county in 2060 ranges from 294,617 to 309,794 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.

Table 6-5. Projected Water Demand, 2020 through 2060 Socorro-Sierra Water Planning Region

Use Sector	Projection	Water Demand (acre-feet) [a]					
		2010 [b]	2020	2030	2040	2050	2060
Socorro County							
Public water supply	High	2,294	2,294 [c]	2,351	2,479	2,555	2,555
	Low	2,294	2,294 [c]	2,294 [c]	2,321	2,343	2,365
Domestic (self-supplied)	High	356	356 [c]	366	388	402	402
	Low	356	356 [c]	356 [c]	361	365	369
Irrigated agriculture	High	141,221	141,221	141,221	141,221	141,221	141,221
	Low	141,221	131,900	133,454	135,007	136,561	136,561
Livestock (self-supplied)	High	1,051	578	683	788	893	946
	Low	1,051	526	578	683	788	893
Commercial (self-supplied)	High	1,348	1,348 [c]	1,392	1,476	1,531	1,531
	Low	1,348	1,348 [c]	1,391	1,414	1,430	1,446
Industrial (self-supplied)	Low/High	51	51	51	51	51	51
Mining (self-supplied)	Low/High	23	23	23	23	23	23
Power (self-supplied)	Low/High	0	0	0	0	0	0
Reservoir evaporation	High	7,570	7,592	7,681	7,737	7,804	7,904
	Low	7,570	7,570	7,570	7,570	7,570	7,570
Sierra County							
Public water supply	High	1,668	1,677	1,820	1,929	2,019	2,077
	Low	1,668	1,668 [c]	1,685	1,750	1,782	1,795
Domestic (self-supplied)	High	168	169	185	197	209	215
	Low	168	168 [c]	170	178	181	183
Irrigated agriculture	High	45,059	45,059	45,059	45,059	45,059	45,059
	Low	45,059	35,507	36,678	39,066	39,066	40,283
Livestock (self-supplied)	High	564	338	395	451	479	536
	Low	564	310	338	395	479	508
Commercial (self-supplied) [d]	High	1,709	1,733	1,888	2,016	2,130	2,197
	Low	1,709	1,713	1,799	1,875	1,917	1,933
Industrial (self-supplied)	Low/High	0	0	0	0	0	0
Mining (self-supplied)	High	17	6,105	17	17	17	17
	Low	17	17	17	17	17	17

[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] Projected future water demand in this sector is based on projected population. Where projected population is lower than the 2010 level, projected demand is set at 2010 withdrawals. The withdrawals in 2010 represent water that has been put to beneficial use and thus represent a valid water right. For planning purposes it is assumed that valid water rights are maintained and will be used in the future.

[d] Additional estimated demand for New Mexico Spaceport added to high and low projections.

Table 6-5. Projected Water Demand, 2020 through 2060
Socorro-Sierra Water Planning Region
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Use Sector	Projection	Water Demand (acre-feet) [a]					
		2010 [b]	2020	2030	2040	2050	2060
Sierra County (cont.)							
Power (self-supplied)	Low/High	0	0	0	0	0	0
Reservoir evaporation	High	100,620	100,916	102,100	102,840	103,727	105,059
	Low	100,620	100,620	100,620	100,620	100,620	100,620
Total region							
Public water supply	High	3,961	3,971	4,171	4,408	4,574	4,632
	Low	3,961	3,961	3,978	4,071	4,125	4,161
Domestic (self-supplied)	High	525	526	550	585	611	618
	Low	525	525	527	538	546	552
Irrigated agriculture	High	186,280	186,280	186,280	186,280	186,280	186,280
	Low	186,280	167,407	170,132	174,073	175,627	176,844
Livestock (self-supplied)	High	1,615	916	1,078	1,239	1,373	1,482
	Low	1,615	836	916	1,078	1,268	1,401
Commercial (self-supplied) [d]	High	3,057	3,081	3,280	3,492	3,661	3,728
	Low	3,057	3,061	3,190	3,290	3,347	3,379
Industrial (self-supplied)	Low/High	51	51	51	51	51	51
Mining (self-supplied)	High	40	6,128	40	40	40	40
	Low	40	40	40	40	40	40
Power (self-supplied)	Low/High	0	0	0	0	0	0
Reservoir evaporation	High	108,190	108,508	109,781	110,577	111,531	112,963
	Low	108,190	108,190	108,190	108,190	108,190	108,190
Total regional demand	High	303,719	309,461	305,231	306,672	308,120	309,794
	Low	303,719	284,071	287,024	291,331	293,193	294,617

[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)

[d] Additional estimated demand for New Mexico Spaceport added to high and low projections.

Demand in the *public water supply* category is projected to increase in both counties under both the low and high scenarios, proportional to the increasing population projections.

Projected water demand in the *commercial* and *domestic* categories is assumed to be proportional to the population growth rates, which are anticipated to increase. The low projection therefore shows a slight increase in use over the projection period, and the high projection calls for a moderate increase.

Agriculture irrigation is the largest use category in Socorro County and the second largest in Sierra County. Based on the information provided in Section 6.2, the current observed trend in declining agriculture use in the two counties is expected to continue for the short-term; for projection purposes this was assumed to be through 2020. However, irrigated agriculture in both counties is dependent in part on surface water and is therefore susceptible to drought; thus, the current drought, along with the recession, is thought to be driving the decline. 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. Additionally, there has been a long-term slow trend of water rights being transferred from irrigated agriculture in Socorro County to municipal use in the Middle Rio Grande. Due to this trend, along with the fact that groundwater supplies more than 10 percent of agriculture irrigation use in both counties, the low projections assume some reduced water use in this category.

The amount of water devoted to irrigated agriculture in Socorro County is projected to remain at current levels through 2060 in the high scenario. Because 21.5 percent of water used for irrigated agriculture in Socorro County was from groundwater in 2010, in the low scenario groundwater for irrigated agriculture is projected to recover to only 85 percent of the 2010 level by 2060 as farmers switch to dryland farming and take land out of production under federal conservation programs. Total 2060 usage (both groundwater and surface water) is projected to be 96.7 percent of 2010 usage.

In Sierra County the amount of water devoted to irrigated agriculture is again projected to remain at current levels through 2060 in the high scenario. However, farmers are dependent on the Elephant Butte Reservoir for irrigation water, and between January 2014 and January 2015 the reservoir never reached more than 14.2 percent of capacity. In 2010, 52.5 percent of the water used for irrigated agriculture in Sierra County was groundwater. Land in irrigated farms dropped by over 60 percent between 2007 and 2012, and this trend is likely to continue as wells have to be drilled deeper at considerable expense, often causing operating losses. The low net income in the agricultural sector combined with the drought make it unlikely that irrigated agriculture can reach 2010 levels by 2060. Accordingly, under the low scenario groundwater usage is projected to recover to only 80 percent of the 2010 level by 2060, bringing total water usage for irrigated agriculture in 2060 to 86.7 percent of total 2010 usage.

The *livestock* segment in Socorro County is projected to recover to 90 percent of 2010 levels by 2060 under the high scenario and to 85 percent under the low scenario. In the latter scenario, it is expected that some ranches will 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.

The livestock segment in Sierra County is expected to recover to 95 percent of 2010 levels by 2060 in the high projection and to 90 percent in the low projection. The dairy producers in the area are expected to remain, as will the hay and alfalfa producers who serve them.

Mining and *industrial* activity in the region is very low and there is no water used for *power*. To collect information on factors affecting potential future water demand, economists conducted interviews to determine if growth is expected in these sectors. Based on these interviews, no significant activity was anticipated. Mining water withdrawals in Sierra County will spike between 2020 and 2030 if the Copper Flat Mine is reopened, but will decline again starting in 2030 because the life of the mine is only expected to be 11 years. The high projection is based on the projected use of the mine (an additional 6,105 acre-feet per year in the decade 2020 [BLM, 2015]), while the low scenario assumes that the mine does not reopen.

The Socorro Sierra region projections include significant water use in the *reservoir evaporation* category due to the presence of Elephant Butte and Caballo reservoirs. Though these reservoirs are almost entirely for the benefit of the downstream users, the use is recorded in the Socorro-Sierra region (Longworth et al., 2013). As discussed in Section 6.5.1, the projected demand is based on 2010 reservoir surface areas so that it can accurately be compared to the 2010 administrative water supply.

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); however, storage opportunities are limited in the region.

- 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.

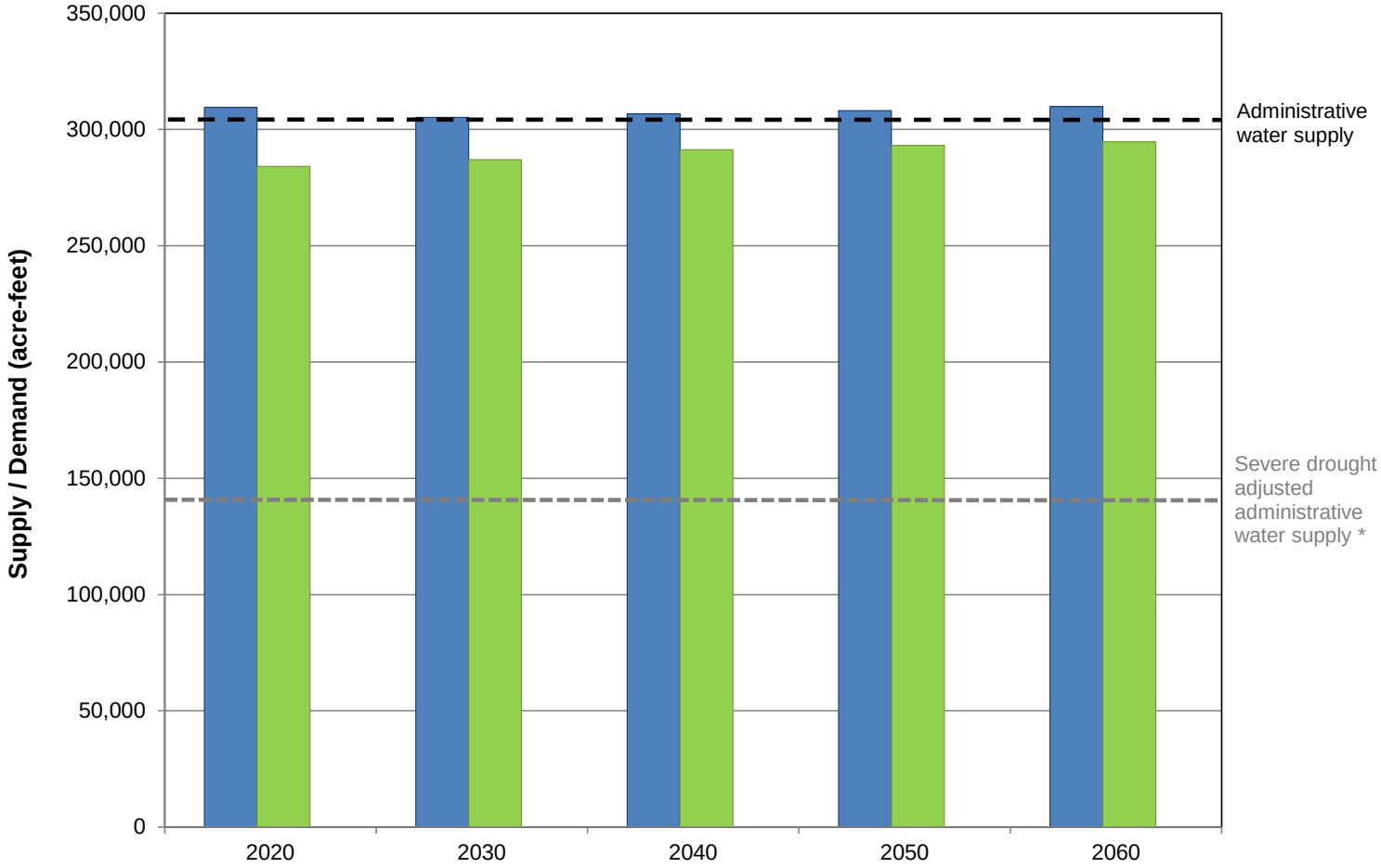
- Supplies in one part of the region may not necessarily be available to meet demands in other areas, particularly in the absence of expensive infrastructure projects. Therefore comparing the supplies to the demands for the entire region without considering local issues provides only a general picture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

- As discussed in Section 6.5.1, the fluctuations in reservoir evaporation are expected to be much greater than the high/low projected range developed for this balance. When comparing the projected demands to the administrative water supply, which is based on 2010 water withdrawals, 2010 surface areas of reservoirs were used to avoid an unrealistic scenario of excess available water. The actual amount of water that will be used for reservoir evaporation is dependent on the surface area of the reservoir and temperatures. During the first year of a drought when there is surface water in storage, the reservoir evaporation could be similar to 2010 use, but after subsequent years of drought, when storage and surface areas are lower, reservoir evaporation would be lower.

- As discussed in Section 4, there are considerable legal limitations on the development of new surface and groundwater resources, given that surface and surface-connected groundwater supplies are fully appropriated and restricted by water right policies, 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, endangered species flow requirements, water quality issues, location and access to water resources, 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 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 303,719 acre-feet and the drought supply is 140,169 acre-feet, or about 46 percent of a normal year administrative water supply. Future water demand projections do not reflect substantial growth in water use (Figure 7-1), due to the declining economy discussed in Sections 3 and 6. However, even without significant growth in demand, major supply shortages are indicated in drought years. Because of its reliance on surface water, the region has a high degree of vulnerability to drought, and the estimated shortage in drought years is expected to range from 143,902 to 169,625 acre-feet. Consequently, developing shortage-sharing agreements and other drought contingency measures, protecting watershed health for the region's surface water supplies, and protecting water rights are priorities in the region.



* Based on the ratio of the minimum streamflow 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

SOCORRO-SIERRA
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 prepare 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. The Socorro-Sierra region considered a variety of strategies for addressing these water management challenges. As discussed in Sections 5 and 7, the Socorro-Sierra region is vulnerable to drought, and there is a large gap between projected demands and drought supplies. This 2016 plan focuses on infrastructure improvement, resource management including watershed and riparian restoration, coordination among local government agencies and water providers, and ways to encourage water use efficiency.

This RWP is building on the 2003 water plan and is considering strategies that will enhance and update, rather than replace, the strategies identified in the accepted water plan. The status of strategies from the previous regional water plan is assessed in Section 8.1. Additional strategies recommended in this RWP update—including a comprehensive table of projects, programs, and policies, key collaborative projects, and recommendations for the state water plan—are discussed in Section 8.3.

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 *Socorro-Sierra Regional Water Plan* recommended the following strategies for meeting future water demand:

- Improve the efficiency of surface water irrigation conveyance systems
  - Gage all diversions from the Low Flow Conveyance Channel (LFCC) to irrigation systems.
  - Evaluate canal seepage losses.
  - Evaluate abandonment of the Socorro Ditch inside the City of Socorro.
  - Evaluate lining or piping reaches of major canals with significant seepage and/or few irrigators.
  - Determine the feasibility of implementing rotational scheduling.
- Improve on-farm efficiency.

- Control brush and weeds along water distribution systems and drains.
- Control non-reservoir surface water evaporation by reducing surface water in engineered and natural locations (LFCC).
- Require proof of sustainable water supply for approval of new developments.
- Encourage retention of water within the planning region.
- Remove exotic vegetation (i.e., salt cedar, Russian olive) on a wide scale.
- Manage watersheds to increase yield and improve water quality.

The steering committee reviewed each of the strategies and indicated that they are all, with the exception of abandonment of the Socorro Ditch, still relevant, though 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.

8.2 Water Conservation

In the Socorro-Sierra Water Planning Region, many water efficiency programs and practices are already in place, having been implemented as recommended in the 2003 accepted plan (Section 8.1); therefore, few new water conservation projects are included in this RWP update. However, water providers in the region will continue to implement their existing water conservation programs and drought contingency plans as well as continued implementation of best management practices in the agricultural sector. As shown in Table 8-1, several agricultural water conservation programs have been implemented since the original plan was accepted in 2003.

8.3 Proposed Strategies (Water Programs, Projects, or Policies)

In addition to continuing with strategies from the previous plan, the Socorro-Sierra region discussed and compiled new project, program, and policy (PPP) information, identified key collaborative projects, and provided recommendations for the state water plan. The recommendations included in this section were prepared by the Socorro-Sierra Regional Water Planning Steering Committee and other stakeholders and reflect their interest and intent. 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.

Table 8-1. Implementation Status of Strategies Identified in Accepted Plan Socorro-Sierra Water Planning Region

Strategy	Status
Improve the efficiency of surface water irrigation conveyance systems	This work is ongoing through various entities including the USDA-Natural Resources Conservation Service, the two soil and water conservation districts (SWCDs), and other funding and technical sources
Gage all diversions from the Low Flow Conveyance Channel (LFCC) to irrigation systems	All diversions have gages installed.
Evaluate canal seepage losses	Status unknown.
Evaluate abandonment of the Socorro Ditch inside the City of Socorro	Socorro Ditch is still active. This strategy is no longer being pursued.
Evaluate lining or piping reaches of major canals with significant seepage and/or few irrigators	Status unknown.
Determine the feasibility of implementing rotational scheduling	The acequias in the region base their scheduling on water rights on the ditch.
	Irrigation districts have implemented rotational schedules.
Improve on-farm efficiency	The Socorro and Sierra SWCDs offer survey, design, and financial assistance to landowners within its boundaries to improve their irrigation efficiency with techniques such as land leveling, irrigation pipeline installation, and concrete ditch lining. This assistance is also provided by the USDA-Natural Resources Conservation Service.
Control brush and weeds along water distribution systems and drains	Routine maintenance addresses some of these issues with weeds and brush in the distribution system.
Control non-reservoir surface water evaporation by reducing surface water in engineered and natural locations (LFCC)	No specific projects have been implemented.
Require proof of sustainable water supply for approval of new developments	No ordinances or changes in policy have been implemented in the region.
Encourage retention of water within the planning region	This strategy continues to be supported by the region. No specific resolutions or ordinances have been implemented.
Remove exotic vegetation (i.e., salt cedar, Russian olive) on a wide scale	Through various funding sources the Socorro and Sierra SWCDs continue to pursue opportunities to complete treatment of exotic vegetation through a variety of treatment methods.
Manage watersheds to increase yield and improve water quality	The SWCDs and various federal and state entities will continue to pursue funding opportunities to improve watershed health. Activities include improvement of timber and riparian health and ecosystem restoration projects.

8.3.1 Comprehensive Table of Projects, Programs and Policies

Over the two-year update process, seven meetings were held with stakeholders in the Socorro-Sierra 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 included in Appendix 8-A. Information was requested during several open meetings, and requests for input were also e-mailed to all stakeholders that had expressed interest in the regional water planning process.

Some water projects were already identified through the State of New Mexico Infrastructure Capital Improvement Plan (ICIP), Water Trust Board, Capital Outlay, and NMED funding processes, and those projects are also included in the Socorro-Sierra PPP table. The projects included are from the 2017-2021 ICIP list (http://nmdfa.state.nm.us/ICIP.aspx, accessed March 2016), which is updated on an annual basis. Therefore, other infrastructure projects that are important to the region may be identified before this RWP is updated again. In general, the region is supportive of water and wastewater, dam safety, and other water-related infrastructure projects.

The PPP list also contains several watershed restoration projects, including some identified in the New Mexico Forest Action Plan. New Mexico State Forestry Division provides annual updates to the recommended watershed restoration projects in the New Mexico Forest Action Plan, and the region is supportive of those ongoing watershed restoration projects, even those that are not specifically identified 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 restoration, flood prevention, water reuse, water rights, water quality, and data collection.

In the Socorro-Sierra region, projects identified on the PPP table are primarily water resource data collection and decision making tool development, improved system infrastructure, irrigation system upgrades, and watershed restoration projects. Because many water conservation programs are already in place, few new water conservation projects are included. However, water providers in the region will continue to implement their water conservation programs.

8.3.2 Key Projects for Regional Collaboration

Prioritizing projects for funding is done by each funding agency/program, based on their current criteria, and 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 for successful implementation of the regional plan. At steering committee meetings held in 2015 and 2016, the group discussed projects that would have a larger regional or sub-regional impact and for which there is interest in collaboration with entities in other water planning regions to seek funding and for implementation.

The group used an informal process of discussing and refining the definition of potential collaborative projects and voting to determine the projects of greatest interest and to identify opposition to proposed projects. Key collaborative projects identified by the steering committee and Socorro-Sierra region stakeholders are shown on Table 8-2.

In order to move forward with implementing the key collaborative projects, additional technical, legal, financial, and political feasibility assessment may be required. A detailed feasibility assessment was beyond the scope and resources for this RWP update.

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 listed in Table 8-2 and the 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.

After group discussion, the Socorro-Sierra region identified the following recommendations to be incorporated into the state water plan:

- Long-term sustainability and resilience of the region's and statewide water resources
- Ongoing regional water planning programs and support for implementation
- Interregional cooperation and communication on PPPs that affect more than one region
- Integration of water supply and wastewater treatment planning for infrastructure
- Statewide economic development initiatives that encourage low water use industries
- Review of regional water planning boundaries

Table 8-2. Key Collaborative Programs, Projects, and Policies
2016 Socorro-Sierra Regional Water Plan
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Project Description	Project Lead	Project Partners	Probable Funding Source(s)	Cost Range	Major Implementation Issues
Surface and groundwater interaction and aquifer mapping					
Understand groundwater and surface water interactions for key river reaches and acequias.	New Mexico Bureau of Geology & Mineral Resources	• New Mexico Interstate Stream Commission (NMISC) • Bureau of Reclamation • U.S. Fish and Wildlife Service • New Mexico Tech	State and federal funding sources	$100,000 – $300,000	
Decision tool development					
Focus on the San Acacia reach and preliminary components have been developed.	University of New Mexico (UNM) or New Mexico Tech	• New Mexico Tech • Bureau of Reclamation • U.S. Fish and Wildlife Service • Middle Rio Grande Conservancy District (MRGCD)	State and federal funding sources and in-kind contributions	$200,000	

Table 8-2. Key Collaborative Programs, Projects, and Policies
2016 Socorro-Sierra Regional Water Plan
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Project Description	Project Lead	Project Partners	Probable Funding Source(s)	Cost Range	Major Implementation Issues
Water resource data sharing					
• Facilitate the sharing of information regarding water issues.	• New Mexico Tech	• Socorro and Sierra counties • Cities of Socorro, Truth or Consequences, and Elephant Butte • Socorro and Sierra Soil and Water Conservation Districts (SWCDs)	• NMISC • New Mexico Department of Finance and Administration planning grant program • Water Trust Board • Local governments	$5,000	Need to ensure support at State and local level to ensure participation
• Develop geodatabase	• New Mexico Bureau of Geology & Mineral Resources				
Agricultural conservation and best management practices					
• Continue implementation of strategies from the 2003 regional water plan • Implement best management practices within MRGCD • Implement best management practices and conveyance improvements for acequias in the region.	• MRGCD • Socorro and Sierra SWCDs	• Farmers • Acequias	• Natural Resources Conservation Service (NRCS) • NMISC Acequia Program • U.S. Department of Agriculture (USDA) • Farm Services Agency (FSA)	Depends on the size of the project.	• Cost • Capacity within the small acequias to acquire funds and manage projects

Table 8-2. Key Collaborative Programs, Projects, and Policies
2016 Socorro-Sierra Regional Water Plan
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Project Description	Project Lead	Project Partners	Probable Funding Source(s)	Cost Range	Major Implementation Issues
Watershed, stream system and wildlife habitat restoration and improvements					
Riparian wildlife habitat availability: • Evaluate interactions of the physical processes on the Rio Grande and its tributaries and the plants and animals that live in reaches of the river located within the planning region. • Use data to help prioritize and develop techniques to evaluate current and potential future riparian ecosystem strength and sustainability. • Develop an ecological model to contribute to the decision support tool for the region.	New Mexico Tech/UNM	• Nature Conservancy • SWCDs • Conservation nonprofits • Sierra Club • Bureau of Reclamation • U.S. Fish and Wildlife Service • New Mexico Environment Department (NMED) • Socorro and Sierra counties	• Public private partnership • Water Trust Board • NRCS • New Mexico Game and Fish • Partners for Fish and Wildlife	$150,000	• Cooperation of private landowners • Maintenance of improvements

Table 8-2. Key Collaborative Programs, Projects, and Policies
2016 Socorro-Sierra Regional Water Plan
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Project Description	Project Lead	Project Partners	Probable Funding Source(s)	Cost Range	Major Implementation Issues
Encourage low water use industry as part of economic development					
Identify opportunities for low water use industry in the region. Include this information in upcoming planning initiatives.	Socorro and Sierra counties	• Local chambers of commerce • Mid Rio Grande Economic Development Association • New Mexico Economic Development District • New Mexico Economic Development Department • New Mexico Partnership	• Local government. • New Mexico Economic Development Department	• In-kind contribution from planning staff. • $5,000–$10,000 research grant.	

Table 8-2. Key Collaborative Programs, Projects, and Policies
2016 Socorro-Sierra Regional Water Plan
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Project Description	Project Lead	Project Partners	Probable Funding Source(s)	Cost Range	Major Implementation Issues
Surface water delivery infrastructure evaluation					•
Evaluate aging infrastructure to identify impacts to current water uses and opportunities for redesign to help meet future demand. Includes conveyance efficiency, sedimentation changes, effects of water loss or gain, and impacts to water quality from changes in water delivery. Will result in a preliminary engineering report (PER).	• MRGCD • Bureau of Reclamation	• NMISC • Sierra and Socorro counties • Sierra and Socorro SWCDs • Acequias • U.S. Fish and Wildlife Service	• Water Trust Board • Capital Outlay • U.S. Army Corps of Engineers • Bureau of Reclamation	$50,000 – $150,000 for PER	

Table 8-2. Key Collaborative Programs, Projects, and Policies
2016 Socorro-Sierra Regional Water Plan
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Project Description	Project Lead	Project Partners	Probable Funding Source(s)	Cost Range	Major Implementation Issues
Water system infrastructure maintenance and upgrades					
Multiple system-specific projects to address water system maintenance and infrastructure needs to meet future demand: • Expansion or installation of additional water lines • Increased capacity for fire flow • Sewer system installation and upgrade • Drilling of new wells, • Installation of meters • Planning documents, source water protection plans, and PERs for water providers in the region that don't have these.	Water systems identified in Appendix 8-A	• NMED • Water providers in the region	• Capital Outlay • Water Trust Board	$50,000 – $150,000 for planning documents	Funding availability

The 2016 Regional Water Plan 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.

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Appendix 2-A

Master Stakeholder List

Socorro-Sierra Region 15 RWP Master Stakeholder List

Updated March 8, 2016

Last	First	Affiliation / Category
		Herald Publishing
		Sierra County Sentinel
Adams	Chris	USFS – Black Range District
Anaya	Frances	Loan Officer, First State Bank
Anderson	Christine	Executive Director, NM Spaceport Authority Business
Anderson	Richard	San Antonio Mutual Domestic Water
Armijo	Jay	Executive Director, South Central Council of Governments
Armijo	Walter	County Commissioner, Sierra County
Bailey	Steven	Magdalena Water Supply System
Banks	Dean	City of Elephant Butte
Barrera	Saul	Caballo Lake State Park
Beck	Andy	New Mexico Water Service Company/National Utilities Elephant Butte
Bhasker	Ravi	Mayor, Socorro
Boykin	Doug	NM State Forestry
Branch	Kenny	USDA Natural Resources Conservation District
Briley	Alan	Manager, City of Elephant Butte
Caldwell	Deb	Executive Director, Chamber of Commerce
Canavan	Chris	NMED – Surface Water Quality Bureau
Carangelo	John	La Joya Acequia
Carr	Ted	Caballo Estates Domestic Coop
Chavez	Adam	Animas Creek Community Ditch
Clark	Kathy	Hot Springs Bathhouse Association
Childress	Bill	Las Cruces District Manager, Bureau of Land Management
Cobble	Kevin	Bosque del Apache National Wildlife Refuge Manager
Cooper	David "Sonny"	New Mexico Boys and Girls Ranch
Cornell	John	Sportsman Coordinator, New Mexico Wildlife Federation
Cosper	Larry	USFS – Black Range District
Cummings	Cody	Cuchillo Creek Community Ditch
Dalrymple	Dave	Monticello Canyon Domestic Water Cooperative Association
Dello Russo	Gina	Retired/Biologist
Dobrott	Steve	Ladder Ranch
Dunlap	Kay	Elephant Butte Lake State Park
Dyjak	Bradford	City Planner, City of Elephant Butte
Emmer	Katie	Copper Flat, The Mack Resources
Fahl	Merry Jo	District Manager, Sierra SWCD
Farr	Beverly	San Miguel Community Ditch

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.

Socorro-Sierra Region 15 RWP Master Stakeholder List

Updated March 8, 2016

Last	First	Affiliation / Category
Fitzpatrick	Danielle	President, Chamber of Commerce Blue Mountain Gallery
Fletcher	Sherry	Resident Water Owner
Fuentes	Juan	City Manager, T or C
Gensler	Dave	MRGCD Hydrologist
Granillo	Kathy	Sevilleta National Refuge
Grantham	Alma	Bank of the Southwest
Griego	Celeste	Assistant to Socorro County Manager
Gritzbaugh	Gary	Hillsboro Mutual Domestic
Grubel	Cate	Desert Alive Nature Center
Gurule	Jordana	USDA Farm Services Agency
Hall	Jeanene	Pargin Realty
Ham	Diane	Sierra County Extension Service
Haywood	Douglas	Project Manager, BLM
Herkenhoff	Corky	Farmer and Socorro SWCD
Helms	Bob and Barbara	Las Palomas Community Ditch
Henderson	Leroy	CCAC
Hille	Rod	
Iapachito	Inez	Alamo Navajo Reservation
Irwin	Robin	New Mexico Ground Water Association
Jefferey	Claudia	Monticello Mutual Domestic
Jones	James	U.S. Bureau of Reclamation
Kairouz	Mary	AMEC
Kent	Eunice	Mayor, City of Elephant Butte
Kolbenschlag	Will	Socorro SWCD
Levine	Lacy	NM Department of Agriculture
Lorimier	Dan	Sierra Club
Louise	Amy	Program Manager URGWOM U.S. Army Corps of Engineers Operations Division, Reservoir Control Branch
Lucero	Willie	State Land Office
Mikkelson	Susann	Farmer, Associate Director Socorro County Chamber of Commerce
Monroe	Lon	Monticello Community Ditch
Montoya	Anita	Polvadera Mutual Domestic Water Association
Montoya	Diego	Mayor, Village of Magdalena
Moore	Lon	
Nelson	Joy	San Acacia MDWCA

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.

Socorro-Sierra Region 15 RWP Master Stakeholder List

Updated March 8, 2016

Last	First	Affiliation / Category
Nicholson	Susanne	Farmer Tourism Director – Chamber of Commerce
Norwood	Kelly	Environmental Compliance, White Sands Missile Range
Person	Mark	NM Tech Hydrologist
Powey	Majorie	Village of Williamsburg
Prescott	Aaron	Business Operations Manager, Spaceport America
Quintana	Hubert	Executive Director, Southeastern NM COG
Rabon	Chad	NM Spaceport Authority
Rincones	Robert	Home and Country Realtors
Ritter	Richard	Chairman Socorro SWCD
Rodriguez	Alicia	White Sands Missile Range
Sager	Salem	Desertaire Water Company, LLC
Saiz	Irene	La Joya MDWCA
Salayendia	Jesus	Truth or Consequences
Salome	Pat	City Clerk Socorro
Santillanes	Jay	City of Socorro Utilities, Division Director
Sichler	Chris	Middle Rio Grande Conservancy District
Skinner	Kim	City Councilor / Chamber President
Slettom	Bill	Resident
Smith	Jessica	Socorro County Extension Service
Smith	Suzanne	Consultant
Stowe	Nyleen-Troxel	Socorro Soil & Water Conservation District
Stubblefield	Debbie	Mayor, Village of Williamsburg
Swingle	Bruce	Sierra County Manager
Tadano	Terry	City of Socorro
Tafoya	Adrian	USDA - NRCS
Tanzy	Brent	U.S. Bureau of Reclamation
Timmons	Stacy	Socorro New Mexico Bureau of Geology & Mineral Resources
Townsend	Hans	President, Truth or Consequesnces Chamber of Commerce
Tripp	Don	Legislator
Towner	Stanley	District Conservationist, USDA NRCS
Walsh	Delilah	County Manager, Socorro County
Ward	Ryan	Water Policy Analyst, New Mexico Department of Agriculture
Wear	Dee	Cooperative Extension Service San Miguel Community Ditch
Work	Norman	Caballo Lake MDWA
Yeh	Max	Percha/Animas Watershed Association

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

Single Comment Document: Summary of Comments on Technical and Legal Sections

Sorroco-Sierra Regional Water Plan Compilation of Comments on Draft Plan

NO.	Comment Source	Location (Section/ Page/ Paragraph)	COMMENTS
1	Katie Emmer, The MAC Resources	Table 5-10	NMCC's DP number and proposed discharge volume has changed. We submitted a new application for a Discharge Permit to the NMED just recently (December 2015). NMED has assigned the site a new permit number and the total volume proposed to be discharged has increased from our last application due to advances in the mine plan engineering. I've attached NMED's public notice flyer on this application so that you have the details from them. We have completed the public notice requirements in January & February. If the Water Plan could have the new correct DP number and discharge volume attached I think it could decrease confusion, if anyone is watching those numbers closely. Previous DP-1 is now DP-1840.
2	Katie Emmer, The MAC Resources	Table 5-9	NMCC's NPDES permit is closed. (#0031101). We had an NPDES permit at the Copper Flat Production Well Field specifically for our aquifer test in 2012. Since that work is complete, we asked EPA to close that permit, which they did and confirmed in the attached letter dated 5 September 2013. I recognize (and only just learned) that the NMED still has this permit up on their website, so it's completely up to you whether you take us off that list or not, I just wanted to note the correct status. I sent an email explaining the situation just today to both Bryan Dail at NMED SWQB and Brad Reid at GWQB to request their help in updating the NMED NPDES list. Dr. Dail said he will talk to their NPDES coordinator, but I don't know how long it might take to get the NMED website corrected.
3	Michel Jichlinski, Principal Ascendant Program Services, LLC	Section 8	Section 8 – Implementation Strategies and Section 8.3 – Proposed Strategies should include the Augustin Plains Ranch project as a Regional (R) Project in the subcategory of Guidance. The Source of the Project Information will be the OSE hearing for the Project. The project as proposed would provide new water to Region 15 and other regions of the Rio Grande Basin. This new water would be delivered by pipeline to supplement or offset the effects of existing uses and new uses over a large part of the Basin, in order to reduce the stress on the current water supply. The plan should recommend that the ISC and the Region 15 jurisdictions evaluate the impacts of the project on the region as future supply to meet existing needs and growing demand. (Detailed explanation/Justification of proposed plan, not included here. Available upon request)
Re: 3 - Steering Committee Response	Steering Committee - Meeting 2 on April 11, 2016		The steering committee asked ISC to acknowledge receipt of the comment and saw no reason to make any change to the plan.
4	Nyleen Troxel Stowe	Section 5 Climate	And this is just a question--are there any SNOTEL sites that give a good approximation for runoff for MRGCD irrigation each year that we should put in section 5.1.1 on page 5 of section 5? The site that is within our region is listed but I don't know if NRCS has a site that would give us that info.
5	Nyleen Troxel Stowe	Page 3 of section 6-6.2.1, last paragraph	Page 3 of section 6-6.2.1, last paragraph on the page, it has that a new chemistry lab will likely be built in the next few years (NM Tech). We might want to change that to "a new chemistry lab is under construction with a completion date of early 2017." The dirt work is done and they had the ground breaking construction celebration yesterday.
6	Nyleen Troxel Stowe	PPP	On the projects, programs and policies table, rows 1, 2, 3, 4, 5, 8 9, 11, 12, 16, 18, 19, 21, 22, are listed as Sierra County and they should be Socorro county.
7	Leroy Henderson	Economic Tables - Section 3	Why, if there are over 700 farms/ranches in Socorro County, does it show in one of the tables (I didn't write it down) no agricultural workers in that county?

Sorroco-Sierra Regional Water Plan Compilation of Comments on Draft Plan

NO.	Comment Source	Location (Section/ Page/ Paragraph)	COMMENTS
8	Leroy Henderson	Table 5-7	Another thing that concerns me is table 5.7 where it shows the tailings dam as a significant hazard for potential contamination if a breach were to happen. On one of the maps I saw I asked why it shows Copper Flat to no longer be an active contamination site, since BLM and THEMAC has now conceded that the mine site has never been fully reclaimed pursuant to today's standards, and has been open to 30 years of weather, which, according to the DEIS, amounts to a very grave potential for underground contamination, which may only be a short distance, or maybe already hitting it, from the Rio Grande. This type of contamination is a concern in the Water Plan Draft on p. 21.
9	Leroy Henderson	Table 6-5	Some of what I am concerned with mostly has to do with some of the mining use figures in table 6.5. I know not much water is currently being used at St. Cloud because of the change in what they are mining now, but several years ago Sierra Flood District transferred 36 ac-ft from down by Williamsburg to Bartoo Sand & Gravel on Cuchillo Creek to be used for gravel operations. That amount was to supplement what Bartoo already used.
10	Leroy Henderson	Table 6-5	In that same table on the future use, high end, it shows only an extra 2,000 ac-ft if the Copper Flat Mine actually gets going. That figure is way low according to the BLM DEIS for the permit request. The minimum amount stated in that doc is 3,600 ac-ft, with a total amount used to be 13,000 ac-ft/yr. What the DEIS does not explain is the math required to show how long it will take to get to that peak use needed for their flotation process. Without getting the old formulas out to do this. I just worked it out in my head to get an estimate of about 7-8 years, or they will have to start out pumping way more than their wells are capable of. The info in the DEIS also states that approx 2,000 ac-ft will be prevented from making it to the Rio Grande as it normally does which appears to be contrary to 5.1, pp 6, 7, and 12, where it talks of trade offs. The DEIS doesn't show any plan to make sure that flow is kept where it is without mining activity.
11	Leroy Henderson	PPP	A policy many of us here in Sierra want listed is one of strict adherence to "proof of water" requirements in local and state land development/subdivision laws. Only one development in Sierra County in the past 20 years had a true proof of water. That was Randy Ashbaugh's 198 unit development meant for the area near the shooting range and old race track, west of I-25. It took the City's water commitment to ~95% of capacity. All the others have never provided a proof of water. HSLD's development had a water report in it done by Stephens and it said there was no definitive proof of water, but the City P&Z and the Commission passed the development request anyway and HSLD disregarded its own report. This should be for any kind of development, including proposed manufacturing or mining. The water actually has to be there or no pass!!!!
12	Katie Emmer, The MAC Resources	Table 6-5	Values reported for future water use in Table 6-5 should be revised to reflect the following updated information: Note: **Offsets to the Rio Grande to be calculated based on impacts by Copper Flat pumping **Copper Flat Average Water Use, 10 years of operation** Estimated Groundwater pumping (2020-2030) — (Ac-ft/year) — 6,141 Offsets in the Rio Grande* — (Ac-ft/year) — 2,000 Net Effect — (Ac-ft/year) — 4,141

Sorroco-Sierra Regional Water Plan Compilation of Comments on Draft Plan

NO.	Comment Source	Location (Section/ Page/ Paragraph)	COMMENTS
13	Katie Emmer, The MAC Resources	Table 5.7	Table 5.7 of the Regional Water Plan shows that the current Copper Flat Tailings Dam is a significant hazard for potential contamination if a breach were to happen. However, The dam has not been used for tailings or water storage since the QMC operation and NMCC has no plans to place the existing dam back into operation. NMCC is monitoring the dam on a regular basis and the Company is in compliance with OSE requirements for management of the inactive dam facility. Therefore, although the existing dam falls into the significant hazard potential rating by definition, the inactive operating status of the mine combined with the limited quantity of mill tailings stored behind the dam and the significant amount of water freeboard and water storage capacity that exists relative to the site run-off potential leads to the conclusion that the risk of failure and potential contamination is very low. More detailed explanation submitted by NMCC available upon request

Appendix 6-A

List of Individuals Interviewed

Appendix 6-A. List of Individuals Interviewed Socorro-Sierra Water Planning Region

Name	Title	Organization	City
Mark Lautman	Economist	Lautman Economic Architecture	Albuquerque
Aaron Prescott	Business Operations Manager	Spaceport America	
Las Cruces			
Hubert Quintana	Executive Director	Southeastern NM COG	Elephant Butte
Stephany Moore	Researcher	New Mexico Tech	Socorro
Deb Caldwell	Executive Director	Socorro County Chamber of Commerce	Socorro
Bradford Dyjak	City Planner	City of Elephant Butte	Elephant Butte
Jay Armillo	Executive Director	South Central COG	Socorro
Danielle Fitzpatrick	Business Owner/Chamber President	Blue Mountain Gallery/Chamber of Commerce	Magdalena
Diego Montoya	Mayor	City of Magdalena	Magdalena
Susann Mikkelson	Farmer/Associate Dir.	Socorro County Chamber of Commerce	Socorro
Alan Brlley	City Manager	City of Elephant Butte	Elephant Butte
Frances Anaya	Loan Officer	First State Bank	Socorro
Jeanene Hall	Realtor	Pargin Realty	Socorro
Robert Rincones	Realtor	Home & Country Realtors	Socorro
Delilah Walsh	County Manager	Socorro County	Socorro
Alma Grantham	Senior VP	Bank of the Southwest	Truth or Consequences
Hans Townsend	President	T or C and Sierra County Chamber of Commerce	Truth or Consequences
Pat Salome	City Clerk	City of Socorro	Socorro
Juan Fuentes	City Manager	City of T or C	Truth or Consequences
Walter Armijo	County Commissioner	Sierra County	Truth or Consequences
Stanley Towner	District Conservationist	USDA - NRCS	Socorro
Adrian Tafoya	District Conservationist	USDA - NRCS	Truth or Consequences
Kim Skinner	City Council member, Chamber president	City of Elephant Butte	Elephant Butte

Appendix 8-A

Recommended Projects, Programs, and Policies

Regional Water Planning Update
Projects, Programs, and Policies
Water Planning Region 15: Socorro-Sierra

Regional (R) or System Specific (SS)	Strategy Type (Project, Program or Policy)	Subcategory	Project Name	Source of Project Information	Description	Project Lead (Entity or Organization)	Partners (Other Entities or Participants)	Timeframe (Fiscal Year)	Planning Phase	Cost	Need or Reason for the Project, Program, or Policy	Comments
R	Project	Water Planning	Synthesis of Information	Water Planning Meeting	Convene a stakeholder group to take a comprehensive look at water use and priority water requirements. With support from technical experts, evaluate and recommend specific actions to provide sustainability of those requirements.	Collaborative effort convened by local stakeholders	NM Tech, USBR, NMISC, COE, USGS, USFWS, NGOs, private landowners, concerned citizens, others			$150,000	Utilizing the information gathered in the first and second steps of this planning process , convene a stakeholder group to take a comprehensive look at water use and priority water requirements. Evaluate and recommend specific actions to provide sustainability of those requirements. Support from technical experts will be necessary to thoroughly evaluate and show how actions will address water use and other stakeholder requirements.	This is step three of a four-fold strategy: (1) compile existing information into a geodatabase, (2) fill data gaps and update information on the dynamics of water movement through the valley, (3) bring all existing data together to assess priority water requirements and sustainability of those requirements, and (4) develop a decision support tool(s) for tracking and informing future water management in and through this reach of river.
R	Program	Watershed restoration	Watershed Restoration and Community Wildfire Protection 2017-2021 ICIP	Water Planning Meeting	Bosque fuels reduction in the Socorro Valley (2017)	Forestry Division of the New Mexico Energy, Minerals and Natural Resources Department	MRGCD, Save Our Bosque Task Force			$200,000	Wildfires impact riparian forests throughout the southwestern US, but in central NM they also have the potential to impact small local communities and water quality in the river and irrigation systems. NM State Forestry Division works with MRGCD and other entities to prioritize and implement this important community protection work.	EMNRD will request varying amounts annually for funding hazardous fuels reduction and defensible space projects that also provide watershed benefits. New Mexico State Forestry has an excellent track record of implementing projects in Socorro County, Rio Grande Bosque. Agreements are in place to match these funds with substantial federal funds.
R	Project	Water System Infrastructure (A)	San Acacia Levee	Capital Outlay		Middle Rio Grande Conservancy District		2015		$800,000		Rolf will provide additional information.
R	Project	Water System Infrastructure (A)	Phase 3 Acacia Levee Project	NMFA		Middle Rio Grande Conservancy District		2015	Phase 3	$1,500,000		
R	Project	Agricultural conveyance infrastructure	Ditch protection from arroyo flooding	Water Planning Meeting	Numerous locations in Socorro Division	Middle Rio Grande Conservancy District	Socorro County	2017			MRGCD Infrastructure is impacted by monsoonal arroyo flows with the current configuration of arroyo crossings. Redesigned crossings would provide for greater protection to MRGCD infrastructure and to surrounding farms and homes.	WTB funding in 2017 to match FEMA grant funding
R	Policy	Water Conservation	Non-water intensive economic development	Water Planning Meeting	Focus on economic development that is not water intensive such as ecotourism.	Middle Rio Grande Economic Development Association						
R	Project	Water conveyance infrastructure evaluation	Infrastructure Evaluation	Water Planning Meeting	Evaluate current infrastructure, its impacts and support of current water uses, and opportunities for redesign or alterations. Incorporate an engineering component to the evaluation of the lifetime of some of these structures and recommend any needed redesigns.	MRGCD, Bureau of Reclamation, USFWS	NM Tech, NMISC, NGOs, others?			$300,000	Current surface water delivery infrastructure was developed in the 1930s to 1950s with additional structures and structure upgrades throughout the last century. A comprehensive look at infrastructure in the reach has not been accomplished to date. In order to evaluate and provide for current and future water needs with trends in reduced water availability, a thorough look at current infrastructure, its impacts and support of current water uses, and opportunities for redesign or alterations in these structures will aid in meeting future water demands. Some of the considerations when evaluating infrastructure include sedimentation changes and effects on water delivery, effects of water loss or gain because of water delivery/ infrastructure, impacts to water quality from changes in water delivery, and seasonal changes on the hydrologic system. Incorporate an engineering component to the evaluation of the lifetime of some of these structures and recommend any needed redesigns.	Incorporated into the second step of a four-fold strategy 2.2: (1) compile existing information into a geodatabase, (2) fill data gaps and update information on the dynamics of water movement through the valley, (3) bring all existing data together to assess priority water requirements, and sustainability of those requirements, and (4) develop a decision support tool(s) for tracking and informing future water management in and through this reach of river.

Regional Water Planning Update
Projects, Programs, and Policies
Water Planning Region 15: Socorro-Sierra

Regional (R) or System Specific (SS)	Strategy Type (Project, Program or Policy)	Subcategory	Project Name	Source of Project Information	Description	Project Lead (Entity or Organization)	Partners (Other Entities or Participants)	Timeframe (Fiscal Year)	Planning Phase	Cost	Need or Reason for the Project, Program, or Policy	Comments
R	Project	Hydrologic Study	Groundwater/Surface Water Interactions	Water Planning Meeting	Update and improve understanding groundwater/surface water interactions for the Rio Grande, San Acacia Diversion Dam to Elephant Butte Reservoir.	NM Bureau of Geology	NM Tech, Bureau of Reclamation, NMISC, USFWS, others?			$120,000 (?)	Update Seepage Information for the Rio Grande, San Acacia Diversion Dam to Elephant Butte Reservoir. An initial seepage study was conducted by the Bureau of Geology and partners in 2003. The same or advanced protocol would be used to repeat this study in order to update information, discover any changes in the system, and obtain additional information about the interconnectivity and water balance in the shallow aquifer in the Socorro Valley. Planning for this project could be streamlined by looking at initial work and updating scope.	Incorporated into the second step of a four-fold strategy 2.1: (1) compile existing information into a geodatabase, (2) fill data gaps and update information on the dynamics of water movement through the valley, (3) bring all existing data together to assess priority water requirements, and sustainability of those requirements, and (4) develop a decision support tool(s) for tracking and informing future water management in and through this reach of river.
R	Program	Monitoring	Long term monitoring of groundwater	Water Planning meeting	Increase the number of long term groundwater monitoring locations for groundwater level measurements, utilizing existing water wells and monitoring wells.	NM Bureau of Geology, OSE/NMISC, USGS		Ongoing, long term	Ongoing	$150,000 annually	The statewide groundwater monitoring network has very limited data in this planning region. These data are essential in interpreting long term effects of pumping, depletion of the aquifer or changes in recharge to the groundwater system.	This could be a collaborative effort with state and federal agencies already working on statewide groundwater monitoring, which currently focuses more heavily on urban centers and critical aquifers.
R	Project	Data collection	Data Compilation and Geodatabase Development	Water Planning Meeting	Compile and consolidate existing salient datasets to construct a geodatabase specific to the Rio Grande in the Socorro & Sierra RWP area.	NM Bureau of Geology; other	NMISC, Bureau of Reclamation, NM Tech, NMBGMR, USFWS, many others	1-3 years			A geodatabase exists for the Middle Rio Grande of New Mexico through the Middle Rio Grande Endangered Species Collaborative Program. Utilizing this information and with guidance of a regional committee, the salient datasets would be recommended and reviewed for compilation. Geodatabase would be constructed within committee guidance, focusing on data that have accurate geographic locations, and relevance to interconnections of water resources in the Socorro Valley.	First step of a four-fold strategy: (1) compile existing information into a geodatabase, (2) fill data gaps and update information on the dynamics of water movement through the valley, (3) bring all existing data together to assess priority water requirements, and sustainability of those requirements, and (4) develop a decision support tool(s) for tracking and informing future water management in and through this reach of river.
R	Policy	Metering	Quantifying water usage	Water Planning meeting	In areas such as the Hot Springs District, studies have shown the need for improved data reporting the actual amounts of water removes from aquifer. In order to assess potential impacts from over-pumping or groundwater removal upon the aquifer, a volume of water removed is essential. POLICY development is first step toward getting voluntary water usage volume records.	NM OSE with Municipal or Rural Water providers.	Well owner cooperation	Ongoing, long term	Ongoing		There is a lack of detailed information about the quantity of groundwater removed from this region.	
R	Project	Data Collection and Modeling	Riparian Wildlife Habitat Availability Analysis	Water Planning Meeting	Develop techniques to evaluate current and potential future riparian ecosystem strength and sustainability using similar tools available from other large river systems. Develop an ecologic model to contribute to a decision support tool. Develop monitoring protocol to update model inputs.	NM Tech and UNM	USFWS, Bureau of Reclamation, NMISC, NMBGMR, Save Our Bosque Task Force, Audubon NM			?	The Socorro and Sierra County sections of the Rio Grande are some of the most diverse riparian habitats in the Southwest. There are stressors to these areas though, that are poorly defined and evaluated in regards to current and potential future water management. The techniques and tools developed under this proposal would allow land and water managers, environmental interests and the local communities to better understand and protect the riparian ecosystem and the species that depend on it.	This is incorporated into the second step of a four-fold strategy 2.3: (1) compile existing information into a geodatabase, (2) fill data gaps and update information on the dynamics of water movement through the valley, (3) bring all existing data together to assess priority water requirements and sustainability of those requirements, and (4) develop a decision support tool(s) for tracking and informing future water management in and through this reach of river.
R	Project	Water Management Tool	Decision Support Tool Development		Complete the development of a Decision Support Tool, parts of which have already been created.	NM Tech and UNM	Bureau of Geology, Bureau of Reclamation, NMISC, USFWS, MRGCD, others			?		This is step four of a four-fold strategy: (1) compile existing information into a geodatabase, (2) fill data gaps and update information on the dynamics of water movement through the valley, (3) bring all existing data together to assess priority water requirements and sustainability of those requirements, and (4) develop a decision support tool(s) for tracking and informing future water management in and through this reach of river.

Regional Water Planning Update
Projects, Programs, and Policies
Water Planning Region 15: Socorro-Sierra

Regional (R) or System Specific (SS)	Strategy Type (Project, Program or Policy)	Subcategory	Project Name	Source of Project Information	Description	Project Lead (Entity or Organization)	Partners (Other Entities or Participants)	Timeframe (Fiscal Year)	Planning Phase	Cost	Need or Reason for the Project, Program, or Policy	Comments
R	Project	Watershed Restoration	Wildlife, Fisheries, and Riparian Habitat Restoration: numerous locations	Water Planning Meeting	Middle Rio Grande ESA Habitat Restoration Improvements in the Isleta and San Acacia Reaches of the Rio Grande	Save Our Bosque Task Force				$450,000	Endangered species habitat improvement benefits the listed species, Rio Grande ecosystem, and local and regional water interests by providing ESA coverage for their projects. These reaches of the Rio Grande have received limited funding to date.	WTB application from Save Our Bosque Task Force to match with federal and other state partners (2017-2020)
R	Project	Water Supply	Water on Wheels	2017-2021 ICIP	Purchase water on wheels and equip the Sierra County Fire Departments. County volunteer fire departments provide fire protection outside of the municipalities in Sierra County. Water sources outside of the municipalities are mostly private wells or small private water systems. To improve the ISO (Insurance Services Office) rating of the fire departments (and the fire insurance rates residents pay) additional water for firefighting is required. The purchase, following the County's procurement regulations, of water tankers will provide the water on wheels. ISO evaluates in their assessment of fire departments. The water tankers will be sized to the specific requirements of the fire department geography and needs to achieve the ISO desired capacity.	Sierra Co.				300,000		
R	Project	Watershed Restoration (thinning)	Watershed Restoration	NMFA		Sierra SWCD		2015		$78,500		
R	Program	Watershed Restoration and Flooding Mitigation	Ephemeral flows designed to safely reach the Rio Grande	Water Planning Meeting	Engineer arroyo mouth alignments on numerous arroyos and tributaries including the Rio Puerco, Arroyo de las Canas, and Arroyo Prieta to allow water and sediment to safely enter the Rio Grande main stem without endangering homes and roads.	Socorro County	Save Our Bosque Task Force, USBR, COE, others	FY 2017-2020		$300,000	Project will provide flooding mitigation at confluence and at infrastructure locations. There is a potential benefit to wildlife, fisheries, and riparian habitat at confluences	Requirements: H & H and floodplain improvements. WTB matching FEMA grant funds scheduled to apply for these funds in 2017
R	Program	Planning	Water Banking	Water Planning Meeting	Address water banking issues within the Socorro County area of the Middle Rio Grande Conservancy District	Socorro County, MRGCD						Need to address water banking issues within the Socorro County Conservancy District where it appears that people sell their water rights and then get water from the water bank. The list of people who do this supposedly goes to the ditch writer and if you haven't paid your dues, you are supposed to have your water cut off. However, ditch writers have had difficult confrontations with landowner when they have tried to enforce. How can this issue be addressed?
R	Program	Monitoring	Weather stations	Water Planning meeting	Increase number of long term monitoring weather stations in Socorro-Sierra region to improve estimates of potential recharge to groundwater	State or federal agency	LeRoy Henderson; local community participation	Ongoing, long term	Ongoing	$200,000 start up. Annual site visits & data maintenance $30,000/year	Spotty weather patterns common in New Mexico make using average model data for groundwater recharge estimations unreliable.	
R	Project	Watershed Restoration (thinning)	Brush Control	Water Planning Meeting	The SWCD has been working on brush control and focuses on watershed health and recharge. They would like to know if there are needs for additional funding for data collection in any areas within the region.	SWCD						
R	Program	Water Conservation	Rain Barrel Collection Systems and Drip Irrigation for Landscaping	Socorro SWCD	Provide 75% cost share for materials cost and up to $600 per practice for landowners for water conservation methods. Agriculture practices include land leveling, irrigation pipeline, concrete ditch lining on ag land for landowners within the Socorro SWCD boundary.	SWCD	Private homeowners	Ongoing (FY July 1 - June 30)	Ongoing	$40,000	Water conservation	The program is funded by a mil levy collected on property tax for Socorro SWCD. Program is offered every year on a first come, first serve basis.
R	Policy	Watershed restoration	Habitat Protection	Water Planning Meeting	Protect ecosystems, riparian habitat for the economic value tied to fishing, hunting and other recreational purposes.		Sierra Club					
R	Program	Water Conservation	Rainwater harvesting	Water Planning Meeting	Promote rainwater harvesting on chile processing.							
R	Program	Water reuse	Water Reuse	Water Planning Meeting	Promote water reuse within water intensive industry that already exists.							Definition of a water-intensive industry is needed.
R	Program	Water Conservation	Water conservation promotion	Water Planning Meeting	Promote existing water conservation incentives						There is funding currently available for water catchment system rebates (SWCD) (this program is new since the last plan)but it is not widely taken advantage of. The city and county can promote water catchment systems, public education and outreach.	

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SS	Project	Water System Infrastructure (M)	New Water Wells	2017-2021 ICIP	To plan and construct four water wells for the community. Alamo Navajo Chapter will be the owner of water well projects and will work with the Office of Environmental Health-Indian Health Service to completed the project. The project will take 27 months to complete and will consists of two phases. Phase I will include ROW, the cultural resource inventory, environmental assessment, planning, and design. The size and type of wells will be determined by Environmental Health-Indian Health Service during the planning and design portion of the project. Phase II will consist of the construction of the wells. One well (north) serve north end of the reservation, the south well will serve south area of the reservation, the east well will serve east area of the reservation and the west well will serve the west end (Pipe Springs) area. The Alamo Chapter will own and operate the will with assistance from Indian Health Service. The Navajo Nation will be the fiscal agent for the project.	Alamo Navajo Chapter				875,000		
SS	Project	Water System Infrastructure (M)	Water Meter Quality Assurance: SCADA system installation	Water Planning Meeting	Install automated metering system (SCADA) to streamline and improve water management in City of Socorro's municipal water utility.	City of Socorro				$630,000	The SCADA system offers Socorro's public water utility staff the ability to track, in real time, water usage, pressure, and delivery system. The installed system leads to greater water system efficiency and water conservation.	(Alternatives Analysis available from City, author: Dennis Engineering Company, Inc.); WTB funding 2017?
SS	Project	Water System Infrastructure (M)	New Waterlines in priority areas in the City of Socorro.	Water Planning Meeting	Replace outdated waterlines to assure water delivery efficiency and limited water losses.	City of Socorro				$300,000	The City of Socorro has been proactive in replacing and upgrading waterlines as funding allowed. There are three priority areas: Spring Street, the Plaza to Garfield Street section, and Bullock Ave. This will bring all waterlines in the City up to current standards and address current leakage issues.	Capital Outlay funds, WTB funding opportunities and City revenues.
SS	Project	Wastewater System Infrastructure (M)	Storm Drain Improvements	NMFA		City of Socorro				$614,100		
SS	Project	Wastewater System Infrastructure (M)	Elephant Butte Sewer System Improve Phase 4	Capital Outlay		Elephant Butte		2015	Phase 4	$150,000		
SS	Project		Water System Capital Improvements	2017-2021 ICIP	Design & Construct upgrade system for capacity, volume and fire flow. Phased project would include increased water lines from approximately 3" in most locations to 6-8" diameters and include up to 50 new hydrants in critical areas. The lack of hydrants available has hindered fire responsiveness and been identified by the City's ISO inspection as crucial to safety and reduction in liability.	Elephant Butte				3,537,000		
SS	Project		Well Improvements/Maintenance	2017-2021 ICIP	For design and construction for proper storage for "Chlorine Contact Time;" Upgrades to the pump houses at each of the three water sources including, but not limited to pitless adapters, new controls, new electrical and new equipment; booster pumps to meet demand and fire safety; distribution lines to eliminate leakage; backflow prevention. We will send out an RFP for the purchase process. We are estimating that we will need to replace about 1000-2000 feet of water lines ranging from 3/4", 5/8", 1", 2" & 4".	Magdalena				540,830		
SS	Project	Water System Infrastructure (M)	Magdalena Water Sys & Well Improve	Capital Outlay	Initial funding allocated for system improvements Additional funding will be needed in the future.	Magdalena				$40,000		Grant has not be executed for FY 17 due to lack of fiscal agent.
SS	Project	Wastewater System Infrastructure (M)	Upgrades To Pump Houses	NMFA		Magdalena,		2015		$350,000		
SS	Project	Water System Infrastructure (M)	Monticello Water System Improvements	2017-2021 ICIP		Monticello Water System				$725,000		

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SS	Project	Water System Infrastructure	San Antonio System Improvements Upgrade Water Lines	San Antonio MDWCA	Water system improvements consisting of upgrading 4" water lines to 8" water lines.	San Antonio MDWCA			PER update is in process	$826,148	The water line upgrade is needed to provide safe and reliable water to residences, businesses, a proposed school and support for future growth. The Socorro Consolidated School District has been planning to construct a new elementary school in San Antonio along NM 1 south of US 380. One of the limitations in proceeding with these plans is the lack of adequate water infrastructure to provide a reliable source of potable water to the school staff and pupils as well as provide fire protection to meet the State of New Mexico Fire Marshal's requirements for schools in rural communities. A water system upgrade would also provide added incentive for existing businesses to expand or new ones to locate within the San Antonio community, thus providing economic stability and growth to the community.	A draft Preliminary Engineering Report (PER) addressing the needs in San Antonio's water system, has recently been completed and submitted for approval. Providing adequate water for fire protection to the school is part of the number 1 priority identified in the PER. The San Antonio MDWCA has applied for a Colonias Grant. The project is ready as soon as funding is available.
SS	Project	Watershed Restoration	Rhodes Property Project	Water Planning Meeting	Riparian Restoration Project on the Rio Grande within the Socorro & Sierra RWP area.	Save Our Bosque Task Force, Socorro Soil and Water Conservation District, Socorro County, FWS Refuges	Other Federal agencies			$500,000	There is no one lead agency for this project since each entity has jurisdiction or authority to work on different lands. This work will improve floodplain connectivity and provide greater wildlife habitat value to numerous species.	2017 WTB application $100,000 to match federal funding
SS	Project	Watershed Restoration	Noxious Tree Species Control with Restoration	Socorro SWCD		Socorro SWCD	BLM State	Ongoing on an annual basis	Ongoing	$62,000	Control water-intensive invasive species and restore less water-intensive native species to the Rio Grande bosque.	Funding has previously been as follows: *State:* Funding has dropped from the previous amount of $42,000/year to $34,625/year *BLM:* $20,000 to $30,000/year for staff, supplies, equipment and herbicide for treatments. The project is ongoing with the Socorro SWCD removing salt cedar and other invasive species, piled for wood cutting and burning. In the spring, they follow up with Rio Grande cottonwood pole planting, late spring with shrub planting and grass seeding during the monsoon season. The BLM provides annual funding to conduct noxious weed treatment on BLM land with approximately 100 acres of BLM land being treated each year.
SS	Project	Water System Infrastructure (M)	Water/Wastewater Line Replacement	2017-2021 ICIP	Plan, design, and construct the replacement of old water and wastewater lines in the southeast section of City from 3rd and Cedar to Riverside. About 60 blocks approximately 24,000 ft. ea. Run 10" or 12" water line from 8th to Corbett across 3rd Street to supply water from high zone to low zone. Water lines currently provide less than adequate fire protection and sewer lines leak. Scope of Work will include an RFP for engineering design Services. Construction contract will be awarded based on bid documents by RFP.	Truth or Consequences				$2,700,000		
SS	Project	Water System Infrastructure (M)	Water Well North	2017-2021 ICIP		Truth or Consequences				$1,950,000		
SS	Project	Water System Infrastructure (M)	Effluent Water to Cemetery	2017-2021 ICIP		Truth or Consequences				$500,000		
SS	Project	Water System Infrastructure (M)	Cook Street Water Storage Improvements	WTB Recommended Projects 1-7-2016 final	Design & Construction	Truth or Consequences				$913,527		
SS	Project	Water System Infrastructure (M)	Waterline Replacement Project	NMFA		Truth or Consequences,				$731,511		
SS	Project	Wastewater System Infrastructure	Replace Sewer Utility Lines	Water planning meeting		Village of Williamsburg						