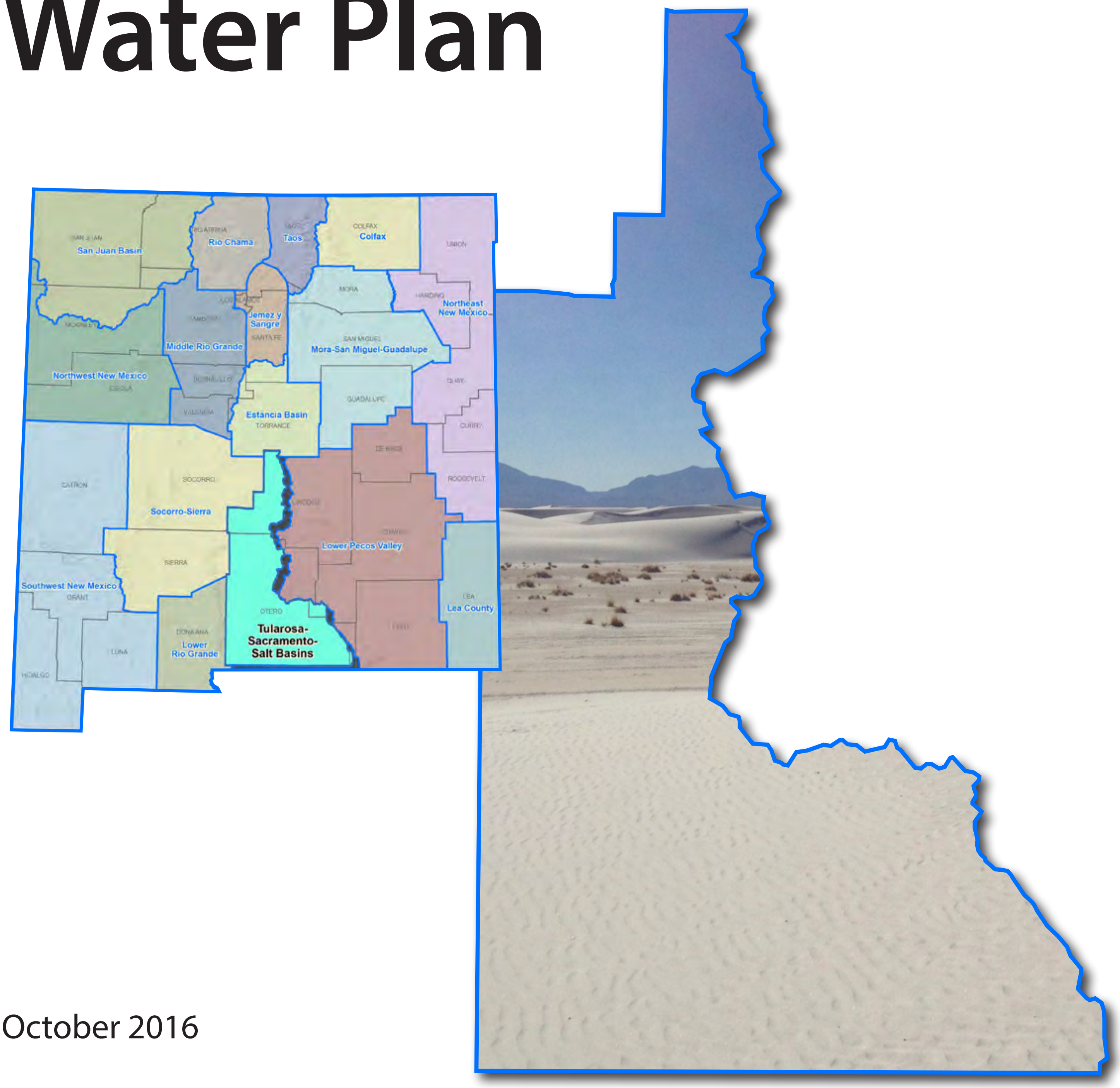
Tularosa-Sacramento-Salt Basins Regional Water Plan



October 2016

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

Cover photograph: White Sands National Monument

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Note: Appendix designations indicate corresponding section in plan

List of Acronyms

°F	degrees Fahrenheit
ac-ft/yr	acre-feet per year
AFB	Air Force base
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
DWS	Domestic Well Statute
EAP	emergency action plan
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
gpm	gallons per minute
GWQB	Ground Water Quality Bureau [New Mexico Environment Department]
ICIP	Infrastructure Capital Improvement Plan
IPCC	Intergovernmental Panel on Climate Change
JSAI	John Shomaker & Associates, Inc.
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
MDWCA	mutual domestic water consumers association
NASS	National Agricultural Statistics Service
NCDC	National Climatic Data Center
NMAC	New Mexico Administrative Code
NMBGMR	New Mexico Bureau of Geology & Mineral Resources

NMED	New Mexico Environment Department
NMEMNRD	New Mexico Energy, Minerals and Natural Resources Department
NMISC	New Mexico Interstate Stream Commission
NMWRRI	New Mexico Water Resources Research Institute
NMOSE	New Mexico Office of the State Engineer
NMSA	New Mexico Statutes Annotated
NMWQCC	New Mexico Water Quality Control Commission
NPL	National Priorities List
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
O&M	operation and maintenance
PDO	Pacific decadal oscillation
PDSI	Palmer Drought Severity Index
PPP	project, program, and policy
PVACD	Pecos Valley Artesian Conservancy District
RWP	regional water plan
SNOTEL	snowpack telemetry
TDS	total dissolved solids
TMDL	total maximum daily load
U.S. EPA	U.S. Environmental Protection Agency
UNM	University of New Mexico
USBR	U.S. Bureau of Reclamation
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGCRP	U.S. Global Change Research Program
USGS	U.S. Geological Survey
UST	underground storage tank
UWB	underground water basin
WBP	watershed based plan
WQA	Water Quality Act (New Mexico)
WRCC	Western Regional Climate Center
WUA	water users association

Executive Summary

The Tularosa-Sacramento-Salt Basins Water Planning Region, which includes portions of Lincoln, Otero, Chaves, and Eddy 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 Tularosa-Sacramento-Salt Basins Regional Water Plan was completed in 2002 and accepted by the NMISC in 2004.

The purpose of this document is to provide new and changed information related to water planning in the Tularosa-Sacramento-Salt Basins 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 2002 plan and provides updated information regarding changed conditions and additional data that have become available.

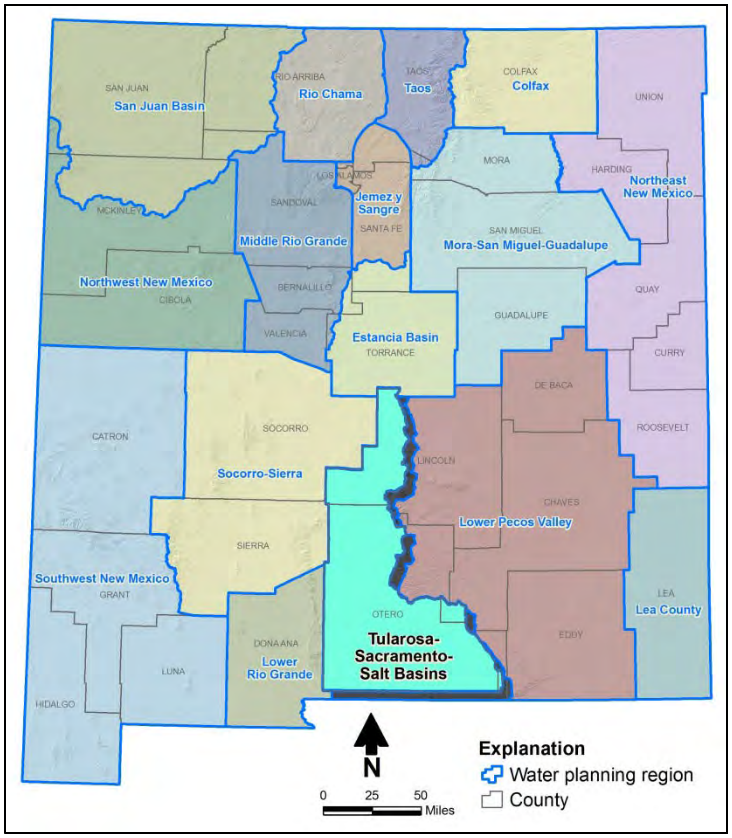


Figure ES-1. Tularosa-Sacramento-Salt Basins Water Planning Region

Based on the updated water demand (Figure ES-2) data, 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. The potential shortage in 2060 during a prolonged drought and due to declining water levels is estimated to range from 13,000 to 15,000 acre-feet. Strategies that the region identified to address shortages and water management challenges include improved understanding of local aquifers, watershed projects to improve forest health, data collection and sharing, agricultural conveyance efficiencies, and water system upgrades and improvements. The region also looked at regionalization of water systems as a way to improve efficiency.

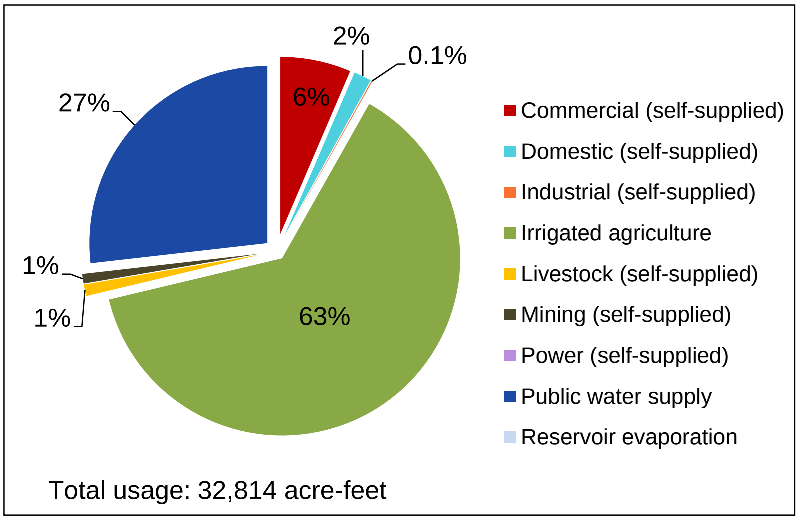


Figure ES-2. Total Regional Water Demand, 2010

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.

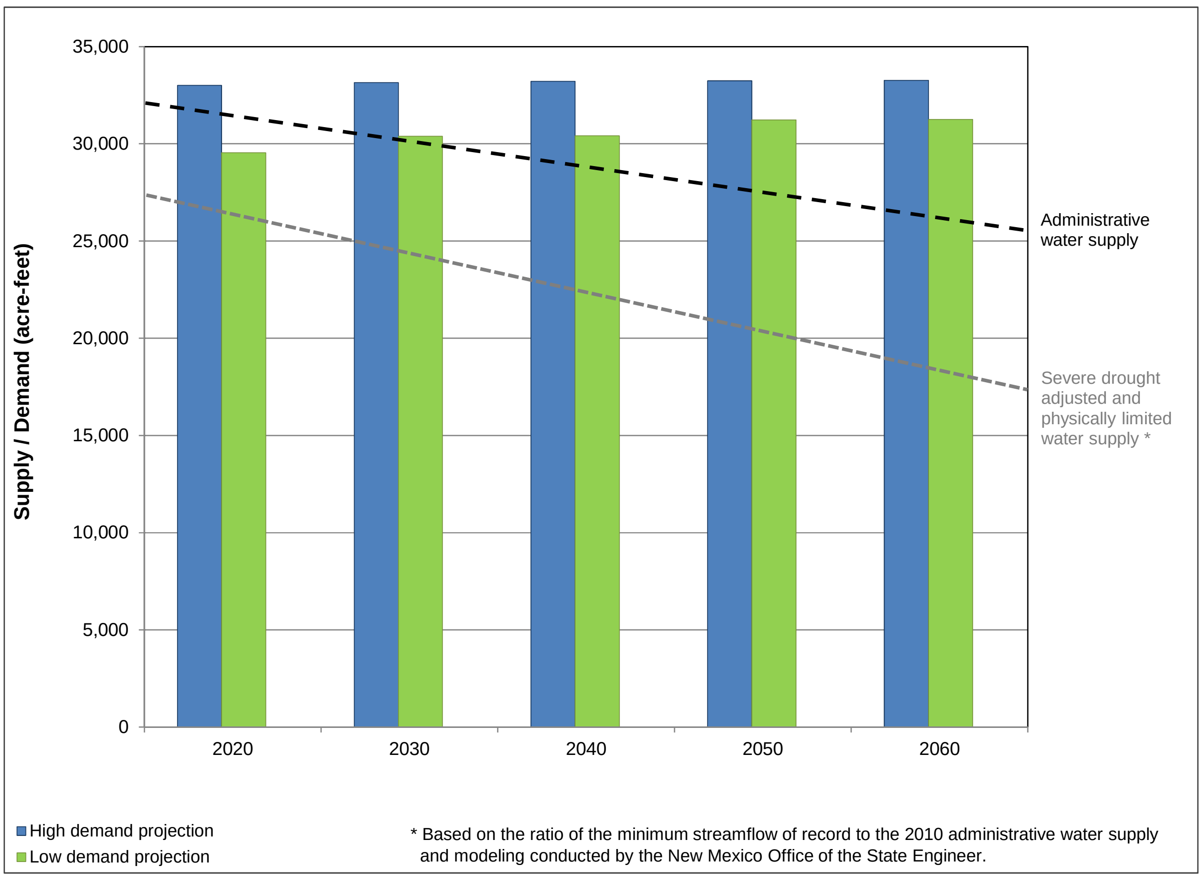


Figure ES-3. Available Supply and Projected Demand

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

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

Common Technical Approach

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

Public Involvement

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

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

Over the two-year update process, eight meetings were held in the Tularosa-Sacramento-Salt Basins 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 Tularosa-Sacramento-Salt Basins region include the following:

- Groundwater quality is an issue in both the Tularosa and Salt basins. Much of the groundwater in the region is brackish, with concentrations of total dissolved solids (TDS) greater than 1,000 milligrams per liter (mg/L). Development of brackish groundwater resources can be an additional source of water supply for this region, but treatment of the water will be required.

- The City of Alamogordo relies on surface water for 70 percent of its supply, 25 percent from Bonito Lake alone, which was damaged by the Little Bear Fire in 2012. Groundwater is available for use when surface water supply is low due to drought or damaged infrastructure, but the average TDS is between 1,500 and 1,800 mg/L. Groundwater is currently blended with surface water to dilute the concentrations of dissolved minerals. The City of Alamogordo received capital outlay funds to be used toward completion of a desalination plant to further facilitate use of the groundwater. The proposed desalination facility would ultimately add up to 4,000 acre-feet per year (ac-ft/yr) of capacity with the first phase of construction beginning in late 2016 or 2017.

- The Brackish Groundwater National Desalination Research Facility was completed and opened in 2007 through a federal partnership between Sandia National Laboratories and the Bureau of Reclamation. The Research Facility is a focal point for developing technologies for the desalination of brackish and impaired groundwater found in the inland states.

- Water levels are declining in some areas of the Tularosa UWB, and if no measures are taken to limit those declines, saline water encroachment may degrade the remaining fresh groundwater. Subdivision development allowing single household wells and septic tanks is another potential source of water quality degradation.

- Notices of intent have been filed by two entities under New Mexico Statutes 72-12-25 through 72-12-28 to drill up to seven wells, each over 2,500 feet in depth, and divert up to 21,500 ac-ft/yr of nonpotable groundwater from the Tularosa Basin.

- Notices of intent have been filed by five entities under New Mexico Statutes 72-12-25 through 72-12-28 to drill up to 33 wells, each over 2,500 feet in depth, and divert up to 143,000 ac-ft/yr of nonpotable groundwater from the Salt Basin. As of the time of this writing, no progress toward drilling or testing of wells has occurred.

- Little groundwater development of the Salt Basin has occurred in New Mexico, but pressure to develop this resource is growing. The Salt Basin is being considered by some entities as a water source to augment supplies in southwest Texas. The water resources of the Salt Basin are needed to meet future demand for the benefit of the State of New Mexico.

- A third of the water supply for the region is derived from tributaries that flow from the Sacramento Mountains into the Tularosa Basin, and this supply has been extremely vulnerable to drought. For example, historically, the average surface water supply has been less than half the supply in 2010. Drought can also result in reduced recharge to the aquifer, further impacting water availability.

- Critical Management Areas (CMAs) in a large portion of the eastern Tularosa Basin restrict new appropriations of groundwater.

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 2002 Tularosa-Sacramento-Salt Basins Regional Water Plan recommended the following strategies for meeting future water demand:

- Public education, water planning committee

- Water conservation (municipal)

- Water conservation (irrigation)
    - Improving off-farm (surface water) conveyance efficiency
    - Improving on-farm efficiency

- Restrictions on development

- Supply blending

- Desalination
- State Engineer special administrative areas
- Water quality and water level monitoring
- Stream gage and climate monitoring
- Watershed management
- Rainfall, snowpack augmentation
- Aquifer storage and recovery
- Tularosa Creek reservoir
- Development of fresh groundwater wells (eastern Tularosa Basin is from Alamo Canyon south to Culp Canyon)

The steering committee reviewed each of the strategies and indicated that all except rainfall and snowpack augmentation are still relevant, though some are being refocused as new recommended strategies.

During the two-year update process the Tularosa-Sacramento-Salt Basins 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 Tularosa-Sacramento-Salt Basins region, projects identified on the PPP table are primarily data collection and monitoring, watershed restoration and evaluation, and water system infrastructure.

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 Tularosa-Sacramento-Salt Basins region stakeholders:

- *Forest Health and Watershed and Stream Restoration.* This strategy includes several different projects. Landscape-scale forest and watershed restoration for 500,000 acres are needed to limit catastrophic fires, mitigate negative effects of wildfire, and protect and restore water quality. Efforts include reducing sedimentation/siltation, thinning and prescribed fire treatments, and stream restoration.

- *Data Collection and Monitoring, Data Analysis, and Aquifer Mapping.* Specific data analyses needed include those to help better understand the water resources and needs in the Salt Basin area, map the distribution of brackish water resources for potable supply, and develop an atlas of water availability in areas experiencing shortages and water level declines. Facilitating the sharing of information regarding water issues with water managers and stakeholders is a key implementation strategy for the region. The regional water planning process supports this regional goal.

- *Agricultural Efficiency and Improvements.* Continued implementation of agricultural water efficiency efforts include laser leveling, lining ditches with concrete, installing pressurized sprinklers and drip irrigation systems, metering agricultural water use, and evaluating whether to continue to maintain or instead to replace the North Fork Fresnal ditch pipeline.

- *Regionalization and Capacity Building for Mutual Domestics and Small Water Systems.* Many of the smaller systems in the region require technical assistance and capacity building. Additionally, due to their relatively close proximity to one another, there are opportunities for collaboration on management and administration as well as potential interconnection. This strategy focuses on identifying opportunities for regionalization and developing capacity for metering and maintenance of infrastructure. Conducting water audits and leak detection for all systems will identify opportunities for conservation and reduce losses of water.

- *Water System Infrastructure Maintenance and Upgrades.* Multiple system-specific projects have been identified that address water system maintenance and infrastructure needs to meet future demand. The projects include expansion of additional water lines, sewer system installation and upgrade, storage tank rehabilitation or installation, water rights acquisition, and development of planning documents such as source water protection plans and preliminary engineering reports.

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

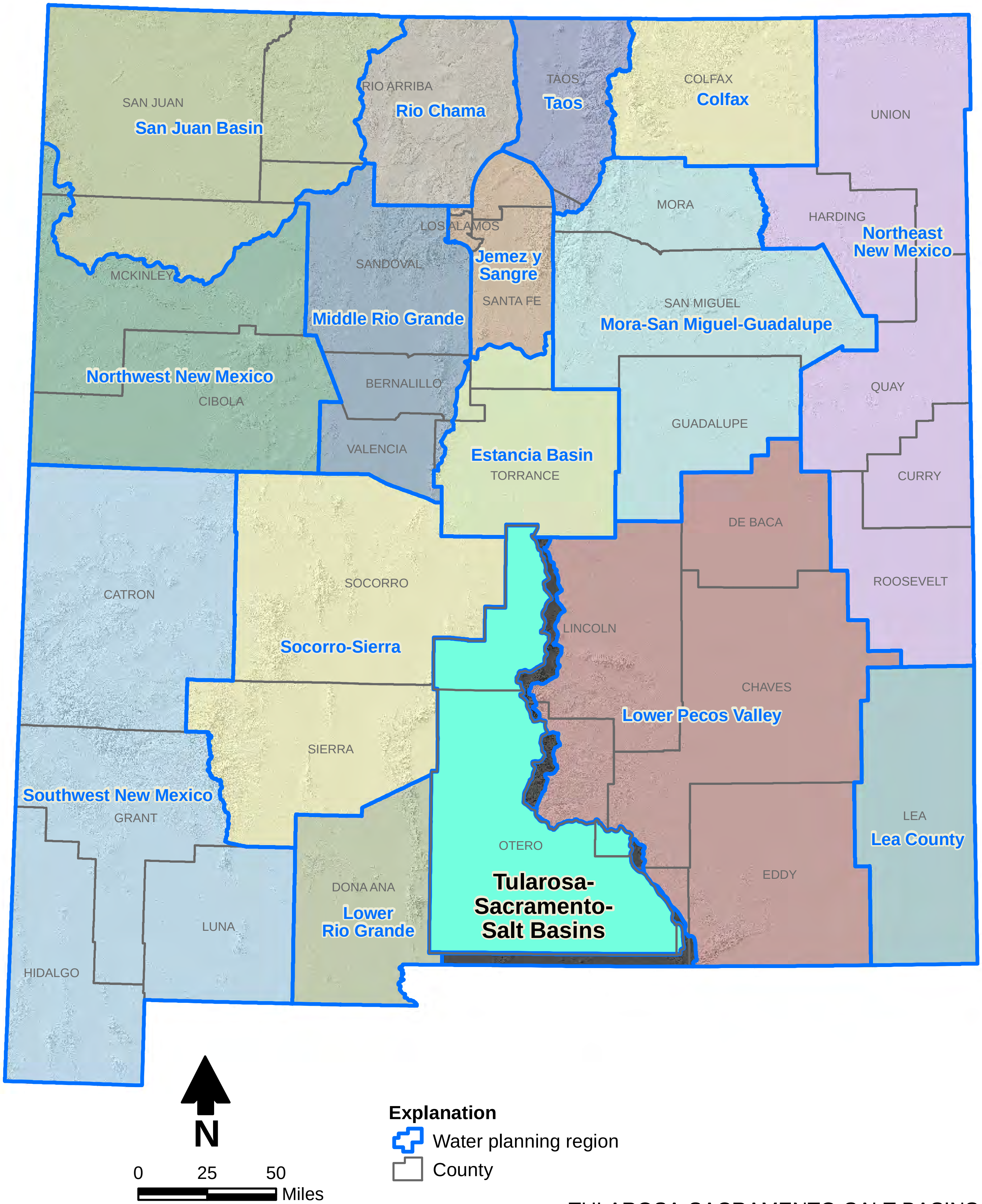
The Tularosa-Sacramento-Salt Basins Water Planning Region, which includes portions of Lincoln, Otero, Chaves, and Eddy counties (Figure 1-1), is one of 16 water planning regions in the State of New Mexico. Regional water planning was initiated in New Mexico in 1987, its primary purpose being to protect 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 *Tularosa Basin and Salt Basin Regional Water Plan 2000-2040* was completed and accepted by NMISC in 2004 (Livingston and JSAI, 2002).

The purpose of this document is to provide new and changed information related to water planning in the Tularosa-Sacramento-Salt Basins 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 2002 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 Tularosa-Sacramento-Salt Basins Water Planning Region.
- Presents recent water use information and develops updated projections of future water demand using the common technical approach developed by the NMISC, in order to facilitate incorporation into the New Mexico State Water Plan.
- Identifies strategies, including infrastructure projects, conservation programs, watershed management policies, or other types of strategies that will help to balance supplies and projected demands and address the Tularosa-Sacramento-Salt Basins 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):



TULAROSA-SACRAMENTO-SALT BASINS
REGIONAL WATER PLAN 2016

Location of Tularosa-Sacramento-Salt Basins Water Planning Region

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Figure 1-1

- Information regarding the public involvement process followed during development of this RWP update and entities involved in the planning process is provided in Section 2.

- Section 3 provides background information regarding the characteristics of the Tularosa-Sacramento-Salt Basins 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 2002 RWP; key information from that plan is summarized in Section 5, with new information that has become available since 2002 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 2002 RWP. Section 6 provides updated population and water use data, which are then used to develop updated projections of future water demand.

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 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.*

- Based on the current water supply and demand information discussed in Sections 5 and 6, Section 7 updates the projected gap between supply and demand of the planning region.
- Section 8 outlines new strategies (water programs, projects, or policies) identified by the region as part of this update, including additional water conservation measures.

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

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

- *Water use* is water withdrawn from a surface or groundwater source for a specific use. In New Mexico water is accounted for as one of the nine categories of use in the *New Mexico Water Use by Categories 2010* report prepared by the New Mexico Office of the State Engineer (NMOSE).
- *Water withdrawal* is water diverted or removed from a surface or groundwater source for use.
- *Administrative water supply* is based on the amount of water withdrawals in 2010 as outlined in the *New Mexico Water Use by Categories 2010* report.
- *Water demand* is the amount of water needed at a specified time.

2. Public Involvement in the Planning Process

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

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

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

- Setting up and facilitating meetings to carry out the regional water plan update process.
- Working with local representatives to encourage broad public involvement and participation in the planning process.
- Working to re-establish steering committees in regions that no longer had active steering committees.
- Supporting the steering committees once they were established.
- Facilitating input from the stakeholders and steering committees in the form of compiling comments to the technical sections drafted by the State and developing draft lists of projects, programs, and policies (PPP) 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 Tularosa-Sacramento-Salt Basins 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 *Tularosa-Sacramento-Salt Basins 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 Tularosa-Sacramento-Salt Basins 2016 regional water plan.

2.2 Public Involvement in the Tularosa-Sacramento-Salt Basins 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 Tularosa-Sacramento-Salt Basins 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 Vicky Milne, Otero Soil and Water Conservation District, as chair.

The steering committee discussed the value of developing subcommittees and determined that watershed and small water system subcommittees would be helpful to identify issues and develop strategies to address supply and demand. However, time limitations and distance made it impractical to organize subcommittee meetings in this phase of planning. Steering committee representatives for these water user groups attended the steering committee meetings and provided input to the process.

Table 2-1. Steering Committee Members, Tularosa-Sacramento-Salt Basins Water Planning Region
Page 1 of 2

Water User Group	Name	Organization / Representation
Agricultural – groundwater	TBD	TBD
Agricultural – surface water user	Norval Bookout	Tularosa Ditch
	Carroll Vann	Fresnal Acequia
Agricultural / Livestock	Bobby Jones	New Mexico Livestock Association
Agricultural / Livestock (technical support to the region)	Greg Duggar	Rancher
Rural water provider	Ray Sanchez	La Luz Mutual Domestic Water Association (MDWA)
County	Victoria A. Milne, District Manager	Otero Soil and Water Conservation District
	Jeff Rabon	Otero Soil and Water Conservation District
County government	Janet White, Commissioner	Otero County
Municipal government	Richard Boss, Mayor	City of Alamogordo
	Brian Cesar, Director	Alamogordo Public Works
	Michael Nivison	Village of Tularosa
	Ray S. Cordova	Village of Tularosa
	Rick Gutierrez	Village of Tularosa
	Ray Dean, Trustee	Village of Carrizozo
	Joe Thornton	Carrizozo Water System
	David Venable, Mayor	Village of Cloudcroft
Tribal government	Thora Padilla	Mescalero Apache Tribe
	Thomas Mendez	Mescalero Apache Tribe
Environmental interest (technical support to the region)	John Cornell, Sportsman Coordinator	New Mexico Wildlife Federation
Extractive industry	—	No mining water use reported in this region
Federal agency (technical support to the region)	Pete Haraden, Hydrology	U.S. Department of Agriculture (USDA) Forest Service, Lincoln National Forest
	April Banks	White Sands Missile Range
	Kelly Norwood, Water Quality	White Sands Missile Range
	Marie Sauter, Superintendent	White Sands National Monument
	David Bustos, Resource Program Manager	White Sands National Monument
	David Griffin, Water Manager	Holloman Air Force Base (AFB)
	John Kipp, Environmental	Fort Bliss, New Mexico

Table 2-1. Steering Committee Members, Tularosa-Sacramento-Salt Basins Water Planning Region
Page 2 of 2

Water User Group	Name	Organization / Representation
Federal agency (technical support to the region)	Laura Doth, Executive Director	South Central Mountain Resource Conservation & Development Council
	Adrian Tafoya, District Conservationist	Natural Resources Conservation Service (NRCS)
	Amanda Wylie-Largeteau	USDA, Otero-Lincoln Farm Service Agency
	Corey Durr	Bureau of Land Management
State agency (technical support to the region)	Joe Savage	New Mexico Environment Department
	Xavier Anderson	New Mexico State Forestry
Local (retail) business (technical support to the region)	Mike Espiritu	Otero County Economic Development Council, Inc.
Watershed interest	Gloria A. Villaverde, PhD, Assistant Professor	Math, Engineering, Science, & Health Division, New Mexico State University Alamogordo
Council of governments	Hubert Quintana, ED	Southern New Mexico Economic Development District

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.

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

- The steering committee agreed that weekday mornings or afternoons would be the best time for scheduling meetings.
- Vicky Milne from the Otero Soil and Water Conservation District agreed to facilitate additional meetings not facilitated by the State.
- Steering committee members will continue to assist with outreach.

Over the two-year update process, seven meetings were held in the Tularosa-Sacramento-Salt Basins region. A summary of each of the meetings is provided in Table 2-2.

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

The steering committee supports ongoing regional water planning meetings as resources are available. Coordination with the neighboring Lower Pecos Valley water planning region would be helpful to both regions.

3. Description of the Planning Region

This section provides a general overview of the Tularosa-Sacramento-Salt Basins Water Planning Region. Detailed information, including maps illustrating the land use and general features of the region, was provided in the 2002 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.

Table 2-2. Tularosa-Sacramento-Salt Basins Region Public Meetings
Page 1 of 3

Date	Location	Purpose	Meeting Summary
FY 2014			
7/24/2014	Tularosa	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			
1/14/2015	Alamogordo	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.
4/29/2015	Alamogordo	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, and programs (PPPs) that had been implemented since the 2008 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.

Table 2-2. Tularosa-Sacramento-Salt Basins Region Public Meetings
Page 2 of 3

Date	Location	Purpose	Meeting Summary
5/28/2015	Tularosa	Review projects completed since submission of the accepted plan and provide additional input. Discuss potential collaborative projects. Discuss elements that would be included in the public involvement chapter and ideas for FY 2015-2016 outreach. Review and discuss future project checklist discussed at previous meeting and provided to stakeholders.	The group reviewed projects completed since submission of the accepted plan and provided additional input regarding watershed projects, the need for collaboration with the neighboring Lower Pecos Valley region, and potential future funding for the overall regional water planning program. Several regional projects were identified and outlined. The future project checklist was reviewed and discussed, and a deadline for sending information to the consultants was confirmed.
FY 2016			
2/25/2016	Otero County Extension Office, Alamogordo, New Mexico	Review steering committee membership and leadership. Focus on the PPPs to be included in the update and the process for submitting comments on the draft RWP.	The group reviewed the steering committee membership and concluded that the list was complete. Some individuals had retired so the list was updated. The group discussed the public comment period and agreed to open up the plan for public comment as soon as it could be organized. The steering committee and interested stakeholders present participated in a brainstorming activity that helped to identify and rank (although ranking of projects for funding priority is not part of the regional water planning update process) 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 4, 2016 at 10:00 a.m.

Table 2-2. Tularosa-Sacramento-Salt Basins Region Public Meetings
Page 3 of 3

Date	Location	Purpose	Meeting Summary
4/4/2016	Lincoln National Forest, Smokey Bear Room, Alamogordo, 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 multiple stakeholders, and discussed and identified key program and policy recommendations. The final meeting was scheduled for May 19, 2016.
5/19/2016	Otero County Extension Office, Alamogordo, 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.

3.1 General Description of the Planning Region

The Tularosa-Sacramento-Salt Basins Water Planning Region is located in south-central New Mexico and includes most of Otero County (except for a small portion within the Lower Pecos Valley Water Planning Region) and the western portion of Lincoln County. Very small portions of Chaves and Eddy counties are also included within the region; however, because these areas are so small and do not include significant water use, population, economic, and water resource data for these counties are not included in this update. The region is bounded on the north by the Estancia Basin Planning Region (Torrance County), on the west by the Socorro-Sierra and Lower Rio Grande Planning Regions (Socorro, Sierra, and Doña Ana counties), on the south by the New Mexico-Texas boundary, and on the east by the watershed divide between the Rio Grande and the Pecos River in Otero, Chaves, Lincoln, and Eddy counties (Figure 1-1). The Village of Cloudcroft straddles the divide between the Tularosa Basin and the Hondo Basin, but obtains its water from the Hondo Basin.

The total area of the planning region is approximately 6,916 square miles, distributed among the four counties as follows:

- Lincoln: 1,329 square miles
- Chaves: 130 square miles
- Otero: 5,433 square miles
- Eddy: 24 square miles

Natural resources in the Tularosa-Sacramento-Salt Basins region include soil, industrial minerals, and forest products.

3.2 Climate

The varied terrain of the planning region results in significant climate variations. For example, temperatures range from lows of 10 degrees Fahrenheit (°F) in the mountains to highs of more than 95°F at lower elevations). The average temperature in the planning region ranges between about 50 and 65°F.

Precipitation is also influenced by location and elevation. Average annual precipitation, including both snowmelt and rainfall, ranges from about 10 inches in the lower elevations to more than 40 inches in the higher elevations of the Sacramento Mountains. Most of the region receives between 9 and 14 inches of precipitation annually. As noted in the 2002 RWP, drought is an important factor in water planning for the region.

3.3 Major Surface Water and Groundwater Sources

Three Rivers Creek, Tularosa Creek, La Luz-Fresnel Creek, and Alamo Stream flow from the western flanks of the Sacramento Mountains into the basin fill sediments, from which the water ultimately discharges through evaporation from playa lakes. Similarly, the Sacramento River captures runoff from the southern end of the Sacramento Mountains and discharges to the sediments of the Salt Basin (Figure 3-1).

The Tularosa-Sacramento-Salt Basins Water Planning Region includes two main NMOSE declared underground water basins (UWBs), the Tularosa and the Salt, and very minor portions of the Roswell and Hueco UWBs. (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.) A map showing the UWBs in the region is provided in Section 4.1.2.2.

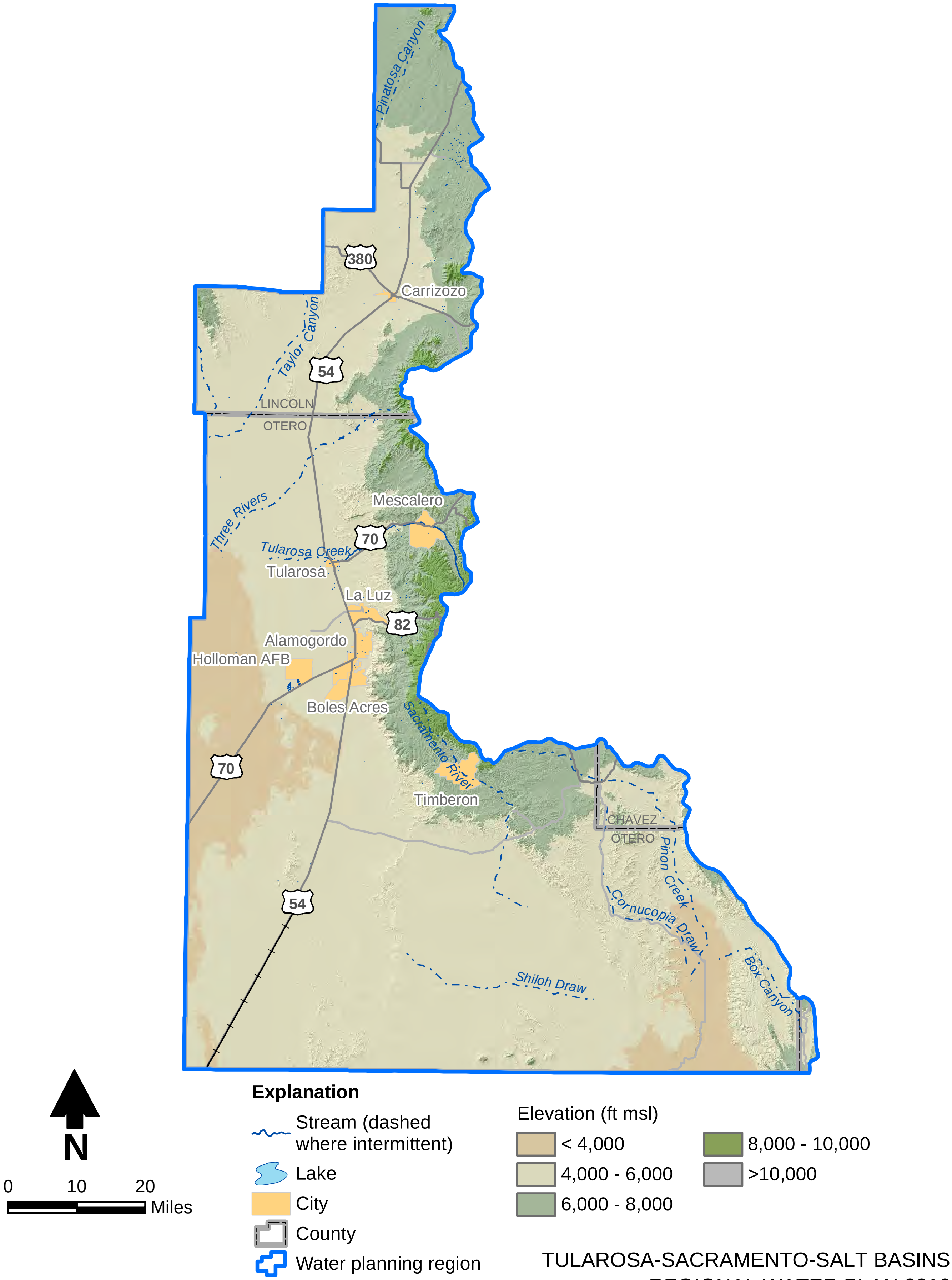
The Tularosa UWB is part of the Rio Grande Rift complex of north-south trending extensional features stretching from northern Mexico to southern Colorado (Hawley, 1978). As with all of these rift structures, the basin is filled with unconsolidated tertiary and quaternary alluvial deposits, and uplifted portions are comprised of “bedrock” material. In the Tularosa UWB, the bedrock consists of the Dakota Group, the Mesaverde Group, the Glorieta Sandstone, the San Andres Limestone, and the Yeso Formation. Because the Tularosa and Salt UWBs are non-stream-connected aquifers, the water entering the basin will collect in playa lakes and evaporate, resulting in increasing salinity near the center of the basins.

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

3.4 Demographics, Economic Overview, and Land Use

The total 2013 population of Otero County (in both the Tularosa-Sacramento-Salt Basins and Lower Pecos Valley planning regions) was 65,616 (U.S. Census Bureau, 2014a). The population for the Tularosa-Sacramento-Salt Basins region in the 2010 census was 60,425 (U.S. Census Bureau, 2014b). As shown in Table 3-1, between 2010 and 2013 the population of Otero County increased by 2.9 percent.

The largest employment categories in Otero County are education, healthcare, government, retail trade, arts, entertainment and recreation, accommodation and food services, and construction. Basic industries in Otero County (those that bring outside dollars into the local economy) are the military, federal and state government, and agriculture.



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TULAROSA-SACRAMENTO-SALT BASINS
REGIONAL WATER PLAN 2016

Regional Map

Figure 3-1

Table 3-1. Summary of Demographic and Economic Statistics for the Tularosa-Sacramento-Salt Basins Water Planning Region
Page 1 of 2

a. Population

County	2000 Total	2010		2013
		Total	Within Region [a]	
Lincoln	19,411	20,497	1,556	20,105
Otero	62,298	63,797	60,425	65,616
Total Region	NA	NA	61,981	NA

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

b. Income and Employment

County	2008-2012 Income [a]		Labor Force Annual Average 2013 [b]		
	Per Capita ($)	Percentage of State Average	Number of Workers	Number Employed	Unemployment Rate (%)
Lincoln	NA	NA	NA	NA	NA
Otero	19,834	83.8	26,447	24,799	6.2

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

c. Business Environment

County	Industry	Number Employed	Number of Businesses
	2008-2012 [a]		*2012* [b]
Lincoln	NA	NA	NA
Otero	Education/Healthcare	5,506	991
	Government	3,553	
	Retail trade	2,637	
	Arts, entertainment, recreation	2,524	
	Construction	2,480	

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

Table 3-1. Summary of Demographic and Economic Statistics for the Tularosa-Sacramento-Salt Basins Water Planning Region
Page 2 of 2

d. Agriculture

County	Farms / Ranches [a]			Most Valuable Agricultural Commodities [b]
	Number	Acreage		
		Total	Average	
Lincoln	NA	NA	NA	NA
Otero	486	1,223,746	2,518	Fruits, tree nuts, berries Cattle, calves Other crops and hay

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

The portion of Lincoln County within the Tularosa-Sacramento-Salt Basins Water Planning Region had a population of 1,556 in 2010, as determined from U.S. Census (2014a) data. No reliable population figure for the portion of Lincoln County in the Tularosa-Sacramento-Salt Basins region is available for 2013. There are 31 residents in the portion of Chaves County within the region and 13 persons within the portion of Eddy County within the region.

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

- Federal agencies: 4,741 square miles
- Tribes: 230 square miles
- State agencies: 688 square miles
- Private entities: 1,257 square miles

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

4. Legal Issues

4.1 Relevant Water Law

4.1.1 State of New Mexico Law

Since the accepted regional water plan for the Tularosa-Sacramento-Salt Basins Water Planning Region was published in 2002, 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 Tularosa-Sacramento-Salt Basins region is discussed in Section 4.1.2.

4.1.1.1 Regulatory Powers of the NMOSE

In 2003, the New Mexico Legislature enacted NMSA 1978, § 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

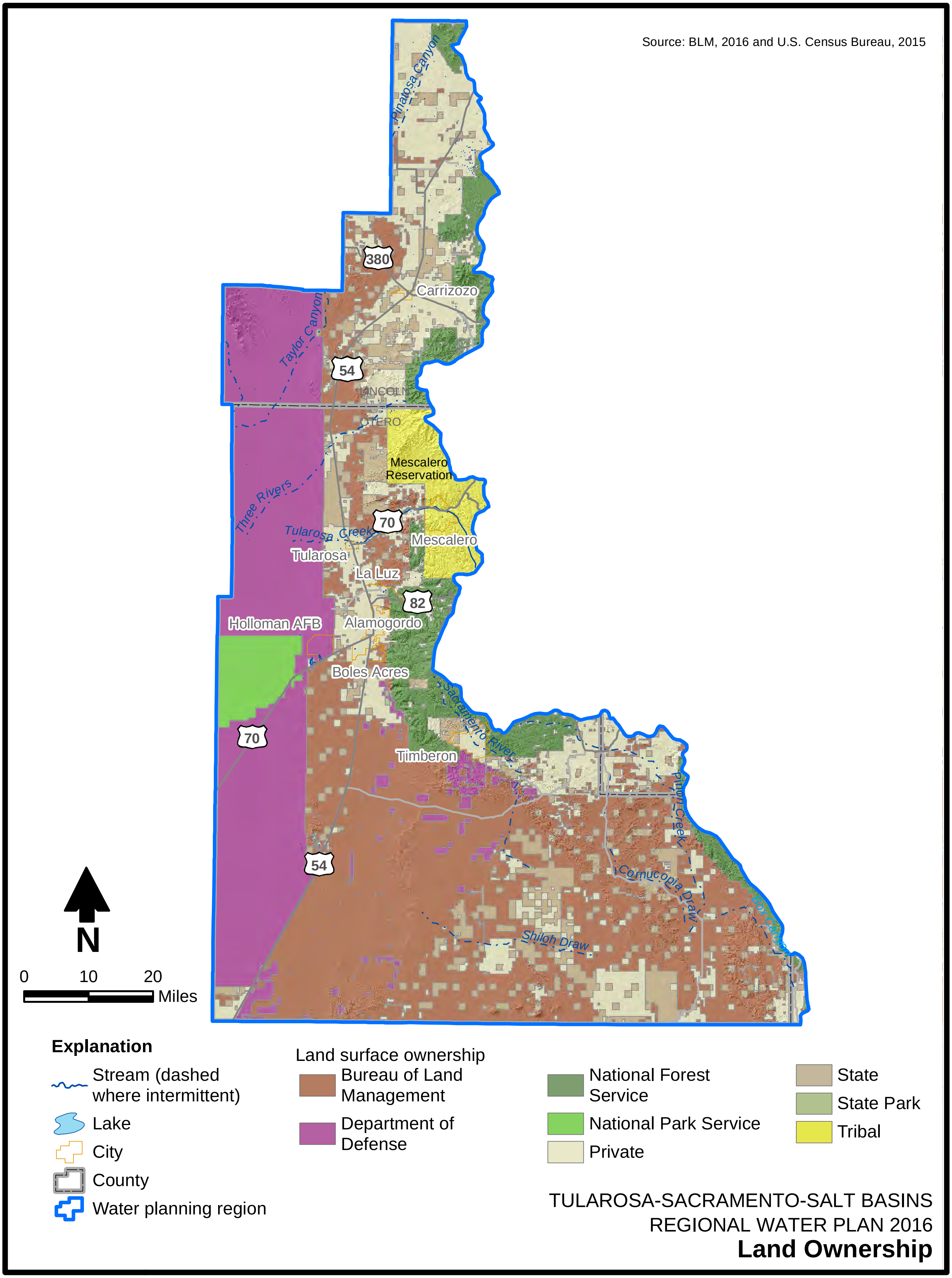


Figure 3-2

S:\PROJECTS\WR12.0165_STATE_WATER_PLAN_2012\GIS\MXDS\FIGURES_2016\TULAROSA_SACRAMENTO_SALTBASINS\FIG3-2_LAND_OWNERSHIP.MXD 5/18/2016 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 Tularosa-Sacramento-Salt Basins 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.

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.

4.1.1.10 Ditch or 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

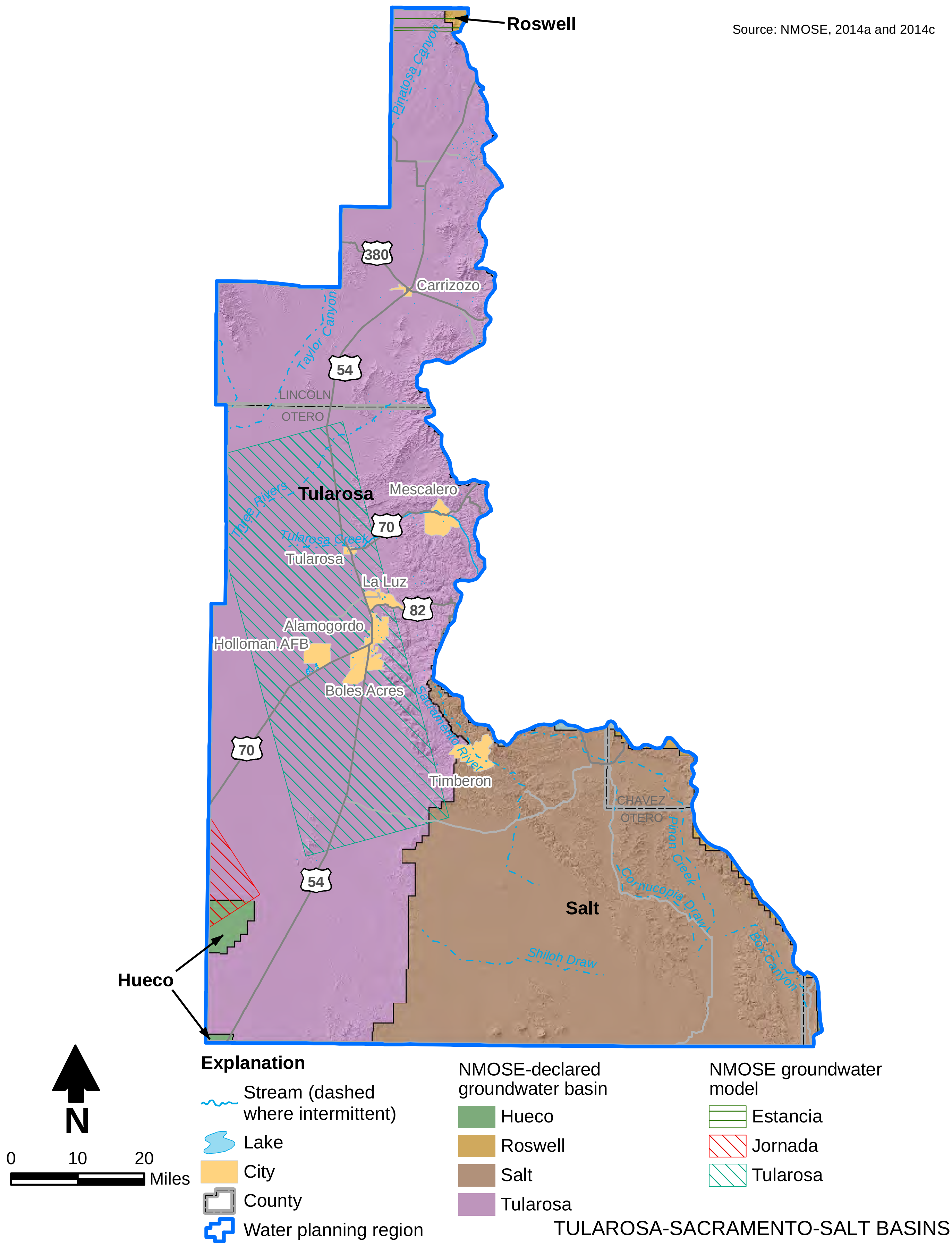
The State Engineer has the power to create water master districts or sub-districts by drainage area or stream system and to appoint water masters for such districts or sub-districts. NMSA 1978, § 72-3-1 (1919). Water masters have the power to apportion the waters in the water master's district under 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). Currently, no water masters have been assigned to the Tularosa-Sacramento-Salt Basins 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 Tularosa-Sacramento-Salt Basins Water Planning Region includes two main NMOSE-declared UWBs: the Tularosa and Salt (Figure 4-1). The region also contains very minor portions of the Roswell and Hueco UWBs. The status of guidelines for these basins is:

- *Tularosa UWB:* This basin was extended in 2005. 19.27.64.1 et seq. NMAC. In 2014, the NMOSE put forth an *Update to the Alamogordo-Tularosa Administrative Guidelines for Review of Water Right Applications* (NMOSE, 2014e). The update provides guidelines on the procedures for processing pending and future water rights applications filed within the Alamogordo-Tularosa Administrative Area, a portion of which is within the Region. The updated guidelines replace the Tularosa Basin Administrative Criteria adopted by the NMOSE in 1997.

- *Salt UWB:* This basin was declared in 2000. No specific guidelines governing appropriations in the Basin have yet been set.



TULAROSA-SACRAMENTO-SALT BASINS
REGIONAL WATER PLAN 2016

NMOSE-Declared Groundwater Basins and Groundwater Models

Figure 4-1

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- *Roswell UWB:* The Roswell Basin Guidelines for Review of Water Right Applications (OSE, 2005), which are applicable to the small portion of the Roswell UWB that falls within the region, are discussed in the Lower Pecos Valley Regional Water Plan.

- *Hueco UWB:* No specific guidelines govern appropriations in the Hueco UWB.

4.1.2.3 AWRM Implementation in the Basin

No priority basins for implementation of AWRM regulations have been designated in the planning region.

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. Community ditches are considered special districts formed to manage community ditch systems and are governed by statute. NMSA 1978, §§ 73-2-1 through 68. Tularosa Community Ditch is a corporation established to distribute water of Tularosa Creek to its shareholders in the vicinity of the Village of Tularosa. Special districts in the Tularosa-Sacramento-Salt Basins region also include soil and conservation districts, which are governed by NMSA 1978, Sections 73-20-25 through 48.

4.1.2.5 State Court Adjudications in the Basin

A 1909 Decree and 1923 Order adjudicate the surface waters of the Tularosa stream and its tributaries:

- Final Decree, *Tularosa Community Ditch v. Tularosa Land and Cattle Company, et al*., Cause No. 293 (in the District Court of the Sixth Judicial District of the Territory of New Mexico, within and for the County of Otero, April 29, 1909)

- Order of November 15, 1923, *Tularosa Community Ditch v. Tularosa Land and Cattle Company, et al*., Cause No. 293. The district court decreed that the surplus waters of Nogal Canyon were part and parcel of the Tularosa stream system and ordered that the same be distributed in accordance with the 1909 Decree.

No additional adjudications are pending in the Tularosa-Sacramento-Salt Basins planning region at the time of writing.

Groundwater rights in the Tularosa, Hueco, and Salt Basins have not been adjudicated and hydrographic surveys have not been completed. A very small portion of the Roswell UWB falls within the region. Groundwater rights in the Roswell UWB have been adjudicated, as discussed in the regional water plan for the Lower Pecos Valley region.

4.1.3 Federal Water Laws

The law of water appropriation has been developed primarily through decisions made by state courts. Since the previous plan was accepted in 2004 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 discussed 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.).

Federally reserved lands within the Tularosa-Sacramento-Salt Basins planning region include the following:

- Mescalero Apache Nation
- Holloman Air Force Base (operates public water system)
- Cibola National Forest
- Lincoln National Forest
- White Sands National Monument
- Fort Stanton-Snowy River Conservation Area
- White Sands Missile Range
- Fort Bliss McGregor Range

4.1.3.2 Interstate Stream Compacts

Not applicable.

4.1.3.3 Treaties

Not applicable.

4.1.3.4 Federal Water Projects

Not applicable.

4.1.3.5 Federal Adjudications in the Basin

Not applicable.

4.1.4 Tribal Law

The Mescalero Apache Nation is the only tribe in the region and has no laws pertaining to water use.

4.1.5 Local Law

Local laws addressing water use have been implemented by both municipalities and counties within the planning region. Note that the local laws for the very small portions of Chavez and

Eddy counties that fall within the region are discussed in the regional water plan for the Lower Pecos Valley planning region.

4.1.5.1 Otero County

The Otero County Code addresses subdivision water use. Chapter 200 of the Code addresses the subdivision of land, and Section 200-22(A) mandates that the State Engineer determine if there is sufficient water for any planned subdivision. Section 200-22(B) allows subdivision approval only if an agreement with an existing community water system or an NMOSE permit allowing sufficient water appropriation is in place.

4.1.5.2 City of Alamogordo

The City of Alamogordo addresses water use in several governing documents. First, the Alamogordo Comprehensive Plan 2000 (03/04/2000) generally recommends water conservation (see § F.1).

Alamogordo also has a 40-year water plan (JSAI and Livingston, 2006). The plan outlines in detail the supply available to the city and the demands on the city for the next 40 years. It then details a list of water development recommendations.

In addition to these planning documents, the Alamogordo Code of Ordinances includes the follow provisions:

- § 28-03-33: Water conservation (water use restrictions [including time of day and day of week restrictions] imposed from May 1 through October 31, grass areas limited in new homes)
- § 28-03-034: Nonessential water use restrictions (prohibits waste of water)
- § 28-03-035: Water rationing (three stages, depending on severity of shortage)
- § 28-03-037: Authorization for the City Manager to restrict water use in unusual circumstances
- § 13.24.60: Recommendation for year-round usage restrictions

4.1.5.3 Village of Tularosa

The Tularosa Village Code of Ordinances includes the following provisions relating to water use:

- § 51.09: Restrictions on water use in times of shortage
- § 51.11(C): Water conservation through time of day and day of week restrictions
- § 52.09: Setbacks from Rio Tularosa for wells and liquid waste disposal systems

4.1.5.4 Village of Cloudcroft

The Cloudcroft Village Code includes the following provisions relating to water use:

- § 7-1A-7: Waste of water prohibition
- § 7-1A-9: Water conservation: restrictions and emergency provisions
- § 7-5-1: Domestic wells not allowed within 300 feet of water distribution lines
- § 7-5-5: Domestic well meter requirement
- § 10-3-5: Subdivision regulations that mandate the transfer of water rights approved by the State Engineer or the payment to the Village in lieu of acquitting water rights for water use on land not located in "original place of Cloudcroft"

4.1.5.5 Lincoln County

Lincoln County addresses water use in several governing documents. First, the Lincoln County Comprehensive Plan (2007) places an emphasis on water issues, with goals that include (1) securing a 100-year water supply, (2) prohibiting drilling of domestic wells on lands from which water rights have been sold, (3) using reclaimed water, and (4) imposing water conservation.

The Lincoln County Subdivision Ordinance 2013-2 includes the following provisions:

- § 17.2: Water availability plan
- § 17.3.1: 40-Year supply requirement
- § : 17.3.4: Maximum water use of 0.25 acre-feet per annum
- § 17.5: Water quality requirements
- § 18.1: Submission of conservation report with preliminary plat

The Lincoln County Ordinance No, 2009-01 (Mining Ordinance), § 4.2(B)(14) requires that an applicant for a mining permit describe water used in connection with mining operations.

Lincoln County Resolution 2000-33 encourages landscaping practices to minimize water usage.

4.1.5.6 Town of Carrizozo

The Town of Carrizozo Ordinance 2002-01 sets forth a three-phase water conservation plan depending on severity of water shortage.

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 Tularosa-Sacramento-Salt Basins Water Planning Region that are subject to protection under the ESA are as follows:

- Least tern (endangered, Otero County)
- Yellow-billed cuckoo (threatened, Otero and Lincoln counties)
- Mexican spotted owl (threatened, implementation of final recovery plan, Otero and Lincoln counties)

- Southwestern willow flycatcher (threatened, implementation of final recovery plan, Lincoln County)
- New Mexico meadow jumping mouse (endangered, Otero County)
- Sprague's pipit (candidate, Otero County)
- White Sands pupfish (under review, Otero and Lincoln counties)

Of the threatened and endangered species found in the Tularosa-Sacramento-Salt Basins region, the protection and recovery of the White Sands pupfish, if listed, the southwestern willow flycatcher, and the yellow-billed cuckoo are most likely to affect water planning within the region. In particular, 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*). The USFWS is implementing a final recovery plan for the species. Again, management of the critical habitat area for the sunflower may impact water use in the planning region.

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 Tularosa-Sacramento-Salt Basins Water Planning Region, all of the federally listed species discussed above are protected also under the New Mexico Act, along with several others.

4.2.2 Water Quality Laws

4.2.2.1 Federal Clean Water Act

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

4.2.2.1.1 NPDES Permit Program (Section 402)

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

The heart of the CWA regulatory regime is the National Pollutant Discharge Elimination System (NPDES) permitting program under Section 402 of the Act. Any person—including a corporation, partnership, state, municipality, or other entity—that discharges a pollutant into waters of the United States from a point source must obtain an NPDES permit from 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 Tularosa-Sacramento-Salt Basins region, the majority of the Sacramento River, along with several other river segments in the Tularosa watershed, is on the impaired list.

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

4.2.2.1.2 Dredge and Fill Permit Program (Section 404)

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

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

4.2.2.1.3 Waters of the United States

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

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

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

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

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

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

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

4.2.2.2 Federal Safe Drinking Water Act

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

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

4.2.2.3 Federal Comprehensive Environmental Response, Compensation, and Liability Act

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

4.2.2.4 New Mexico Water Quality Act

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

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

Because copper mining occurs in the basin it is also important to note that in 2009 the Legislature amended the WQA to require the Commission to adopt regulations particular to the copper industry that would specify the measures to be taken to prevent water pollution and to monitor water quality. NMSA 1978, § 74-6-4(K). Effective December 2013, the Commission adopted the Copper Mine Rule. 20.6.7 NMAC. The stated purpose of the Copper Mine Rule is "to control discharges of water contaminants specific to copper mine facilities and their operations to prevent water pollution." 20.6.7.6 NMAC. However, the rule also allows for contamination of groundwater at copper mines in excess of groundwater quality standards. *E.g.*, 20.6.7.17 NMAC, 20.6.7.20 NMAC, 20.6.7.21 NMAC, 20.6.7.22 NMAC, 20.6.7.28 NMAC. The legality of these provisions has been questioned. For example, the New Mexico Attorney General has challenged the Copper Mine Rule in an appeal. Although the Court of Appeals upheld the rule, *Gila Res, Info. Project v. N.M. Water Quality Control Comm'n*, 2015-NMCA-076, 355 P.3d 36, the New Mexico Supreme Court granted *certiorari* on July 13, 2015 (Nos. S-1-SC-35,279, 35,289, & 35,290)).

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 Mescalero Apache Tribe has not adopted surface water quality standards.

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

There has been a local push to list Otero Mesa in the region as an area of critical environmental concern or as a National Monument. If either were to occur, the impact on the water resources of the area would need to be examined.

5. Water Supply

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

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

The Handbook specifies that each of the 16 regional water plans briefly summarize water supply information from the previously accepted plan and provide key new or revised information that has become available since submittal of the accepted regional water plan. The information in this section regarding surface and groundwater supply and water quality is thus drawn largely from the accepted *Tularosa Basin and Salt Basin Regional Water Plan 2000-2040* (Livingston and JSAI, 2002) 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 Tularosa-Sacramento-Salt Basins region are:

- Groundwater quality is an issue in both the Tularosa and Salt Basins. Much of the groundwater in the region is brackish, with concentrations of total dissolved solids (TDS) greater than 1,000 milligrams per liter (mg/L). Development of brackish groundwater resources can be an additional source of water supply for this region, but treatment of the water will be required.

- The City of Alamogordo relies on surface water for 70 percent of its supply, 25 percent from Bonito Lake alone, which was damaged by the Little Bear Fire in 2012. Groundwater is available for use when surface water supply is low due to drought or damaged infrastructure, but the average TDS is between 1,500 and 1,800 mg/L (CHM Smith, 2014). Groundwater is currently blended with surface water to dilute the concentrations of dissolved minerals. The City of Alamogordo received capital outlay funds to be used toward completion of a desalination plant to further facilitate use of the groundwater. The proposed desalination facility would ultimately add up to 4,000 acre-feet per year (ac-ft/yr) of capacity with the first phase of construction beginning in late 2016 or 2017 (BLM, 2012).

- The Brackish Groundwater National Desalination Research Facility was completed and opened in 2007 through a federal partnership between Sandia National Laboratories and the Bureau of Reclamation (USBR, 2015). The Research Facility is a focal point for developing technologies for the desalination of brackish and impaired groundwater found in the inland states.

- Water levels are declining in some areas of the Tularosa UWB, and if no measures are taken to limit those declines, saline water encroachment may degrade the remaining fresh groundwater. Subdivision development allowing single household wells and septic tanks is another potential source of water quality degradation.

- Notices of intent have been filed by two entities under New Mexico Statutes 72-12-25 through 72-12-28 to drill up to seven wells, each over 2,500 feet in depth, and divert up to 21,500 ac-ft/yr of nonpotable groundwater from the Tularosa Basin.

- Notices of intent have been filed by five entities under New Mexico Statutes 72-12-25 through 72-12-28 to drill up to 33 wells, each over 2,500 feet in depth, and divert up to 143,000 ac-ft/yr of nonpotable groundwater from the Salt Basin. As of the time of this writing, no progress toward drilling or testing of wells has occurred.

- Little groundwater development of the Salt Basin has occurred in New Mexico, but pressure to develop this resource is growing. The Salt Basin is being considered by some entities as a water source to augment supplies in southwest Texas. If the water resources of the Salt Basin are appropriated to supply southwest Texas, it would deprive southern New Mexico of a future water source for the satisfaction of future demands.

- A third of the water supply for the region is derived from tributaries that flow from the Sacramento Mountains into the Tularosa Basin, and this supply has been extremely vulnerable to drought. For example, historically, the average surface water supply has been less than half the supply in 2010. Drought can also result in reduced recharge to the aquifer, further impacting water availability.

- Critical Management Areas (CMAs) in a large portion of the eastern Tularosa Basin restrict new appropriations of groundwater.

5.1 Summary of Climate Conditions

The 2002 regional water plan (Livingston and JSAI, 2002) 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 Tularosa-Sacramento-Salt Basins 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 Lincoln and Otero counties and identifies two stations that were used for analysis of weather trends. These two 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 snow course station and were used to document snowfall in the Sacramento Mountains (Table 5-1). The locations of the climate stations for which additional data were analyzed are shown in Figure 5-1.

Table 5-1. Tularosa-Sacramento-Salt Basins Climate Stations

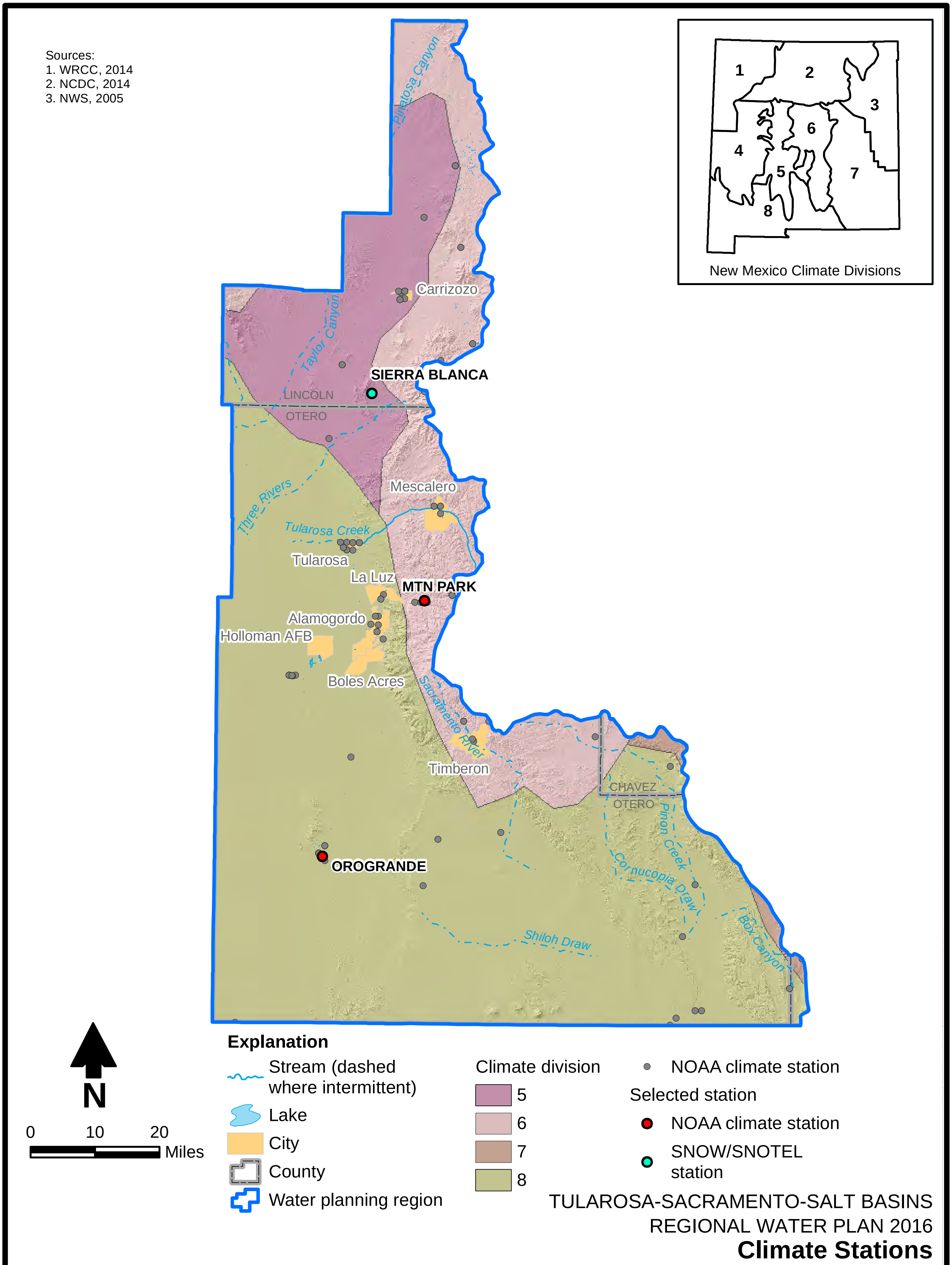
Climate Stations [a]	Latitude	Longitude	Elevation	Precipitation		Temperature	
				Data Start	Data End	Data Start	Data End
Lincoln County							
Ancho	33.93	–105.75	6,125	7/1/1909	12/31/1971	7/1/1913	12/31/1971
Carrizozo	33.65	–105.88	5,418	5/1/1908	6/30/2011	6/1/1908	10/31/2011
Nogal Lake	33.53	–105.70	7,165	5/1/1913	9/30/1951	—	—
Otero County							
Alamogordo	32.96	–105.94	4,701	7/1/1909	1/31/2009	1/1/1913	1/31/2009
Alamogordo 1	32.87	–105.93	–99,999	1/1/1893	9/30/1943	1/1/1892	3/31/1943
Cienega 5 SSW	32.03	–105.10	3,802	11/1/1955	5/31/1963	2/28/1957	5/31/1963
Lulu	32.43	–105.62	5,003	7/1/1947	11/30/1961	—	—
Mescalero	33.15	–105.78	6,716	6/1/1911	9/30/1978	6/1/1911	9/30/1978
Mountain Park	32.95	–105.82	6,780	11/1/1894	Present	11/1/1894	Present
Orogrande 1 N	32.38	–106.10	4,203	12/1/1904	Present	12/1/1904	Present
Pinon (Near)	32.65	–105.37	6,058	5/1/1916	6/30/1923	—	—
Tularosa	33.07	–106.04	4,430	4/1/1908	3/31/2011	4/1/1908	11/30/2012
White Sands Natl Mon	32.78	–106.18	4,006	1/1/1939	Present	1/1/1939	Present
Snotel Stations							
Sierra Blanca – Snow	33.42	–105.97	10,280	1986	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.



TULAROSA-SACRAMENTO-SALT BASINS
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Climate Stations

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.

Precipitation varies considerably across the planning region and is influenced by both location and elevation. 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 snow course station in the planning region, the Sierra Blanca snow station, which provides snow depth and snow water equivalent data (Figure 5-5) (NRCS, 2014a). The Sierra Blanca site is located at 10,280 ft amsl near the headwaters of the North Fork Rio Ruidoso and has been operational since 1986.

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 Sierra Blanca stations is provided on Figure 5-5. The figure shows that the snowpack and snow water equivalent varies greatly, from 0 to more than 20 inches.

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

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

Table 5-2. Temperature and Precipitation for Selected Climate Stations Tularosa-Sacramento-Salt Basins Water Planning Region

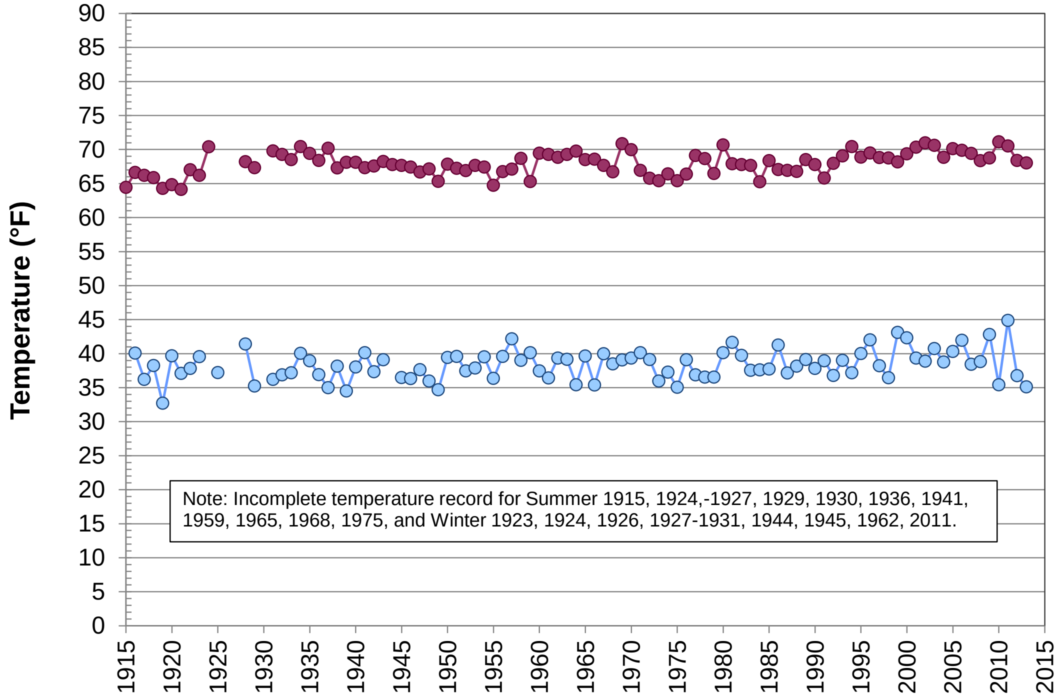
Station Name	Precipitation (inches)				Temperature			
	Average Annual [a]	Minimum [b]	Maximum [b]	% of Possible Observations [c]	Average (°F) Annual [d]	Average (°F) Minimum [e]	Average (°F) Maximum [e]	% of Possible Observations [c]
Mountain Park	19.24	9.89	29.19	90.2	53.2	40.3	66.0	59.3
Orogrande 1 N	10.12	22.53	2.93	96.1	61.7	45.8	77.6	57.7

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

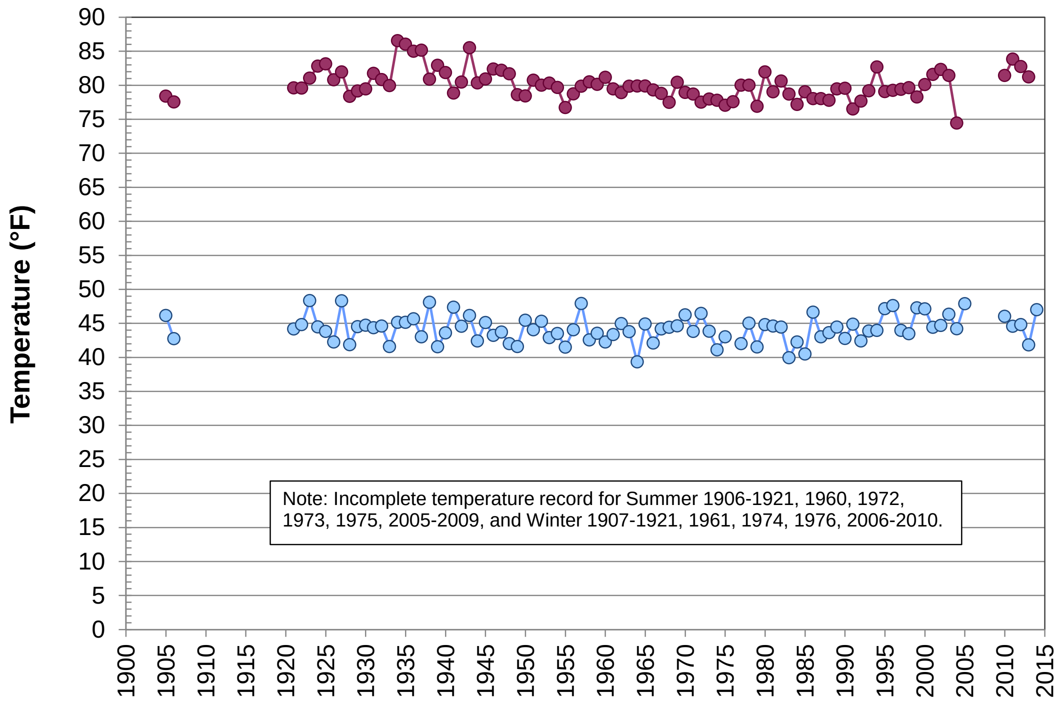
ft amsl = Feet above mean sea level
°F = Degrees Fahrenheit

[a] Average of annual precipitation totals for the period of record at each station.
[b] Minimum and maximum recorded annual precipitation amounts for each station.
[c] Amount of completeness in the daily data set that was recorded at each station (e.g., 99% complete means there is a 1% data gap).
[d] Average of the daily average temperatures calculated for each station.
[e] Average of the daily minimum (or maximum) temperature recorded daily for each station.

Mountain Park



Orogrande 1 N



Average summer temperature (June, July, August)
Average winter temperature (December, January, February)

TULAROSA-SACRAMENTO-SALT BASINS
REGIONAL WATER PLAN 2016

Average Temperature, Mountain Park and Orogrande 1 N Climate Stations

Figure 5-2

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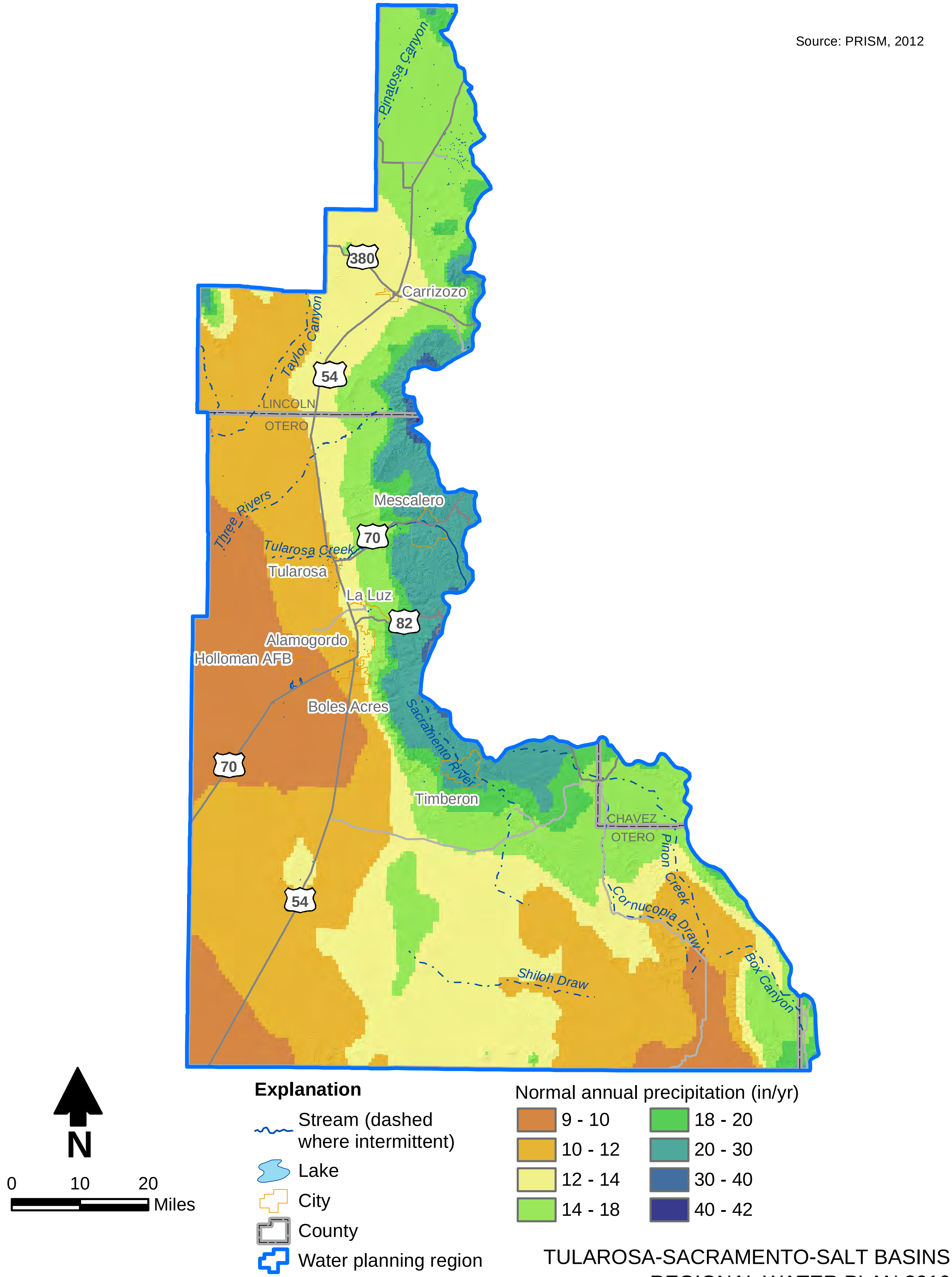

TULAROSA-SACRAMENTO-SALT BASINS
REGIONAL WATER PLAN 2016

Average Annual Precipitation (1980 to 2010)

Figure 5-3

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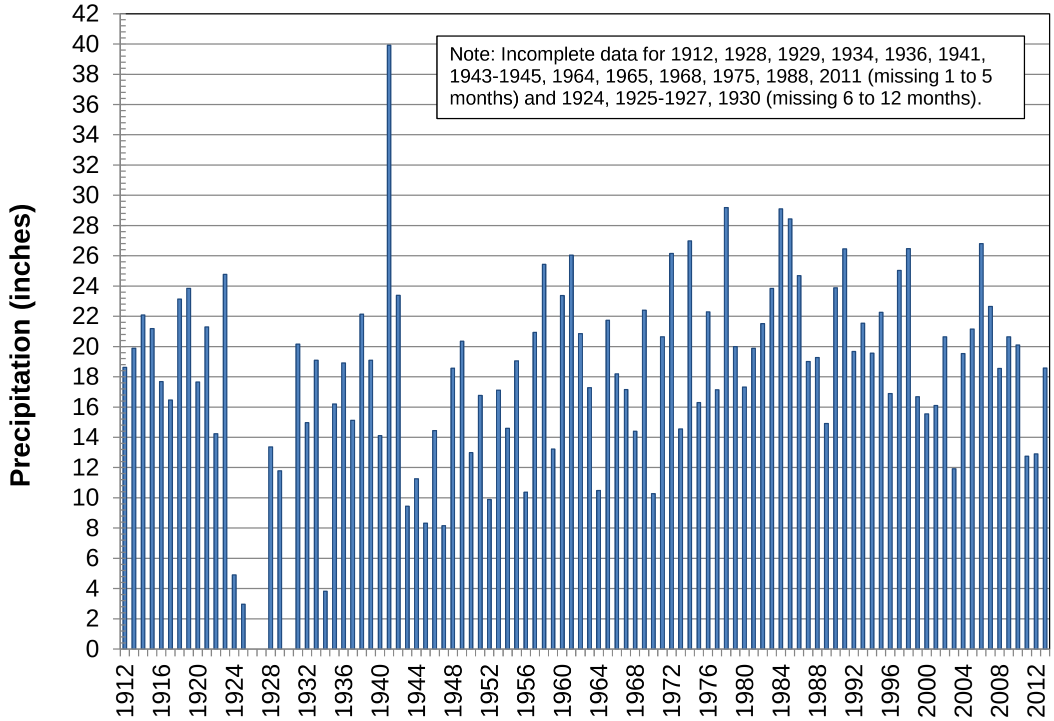
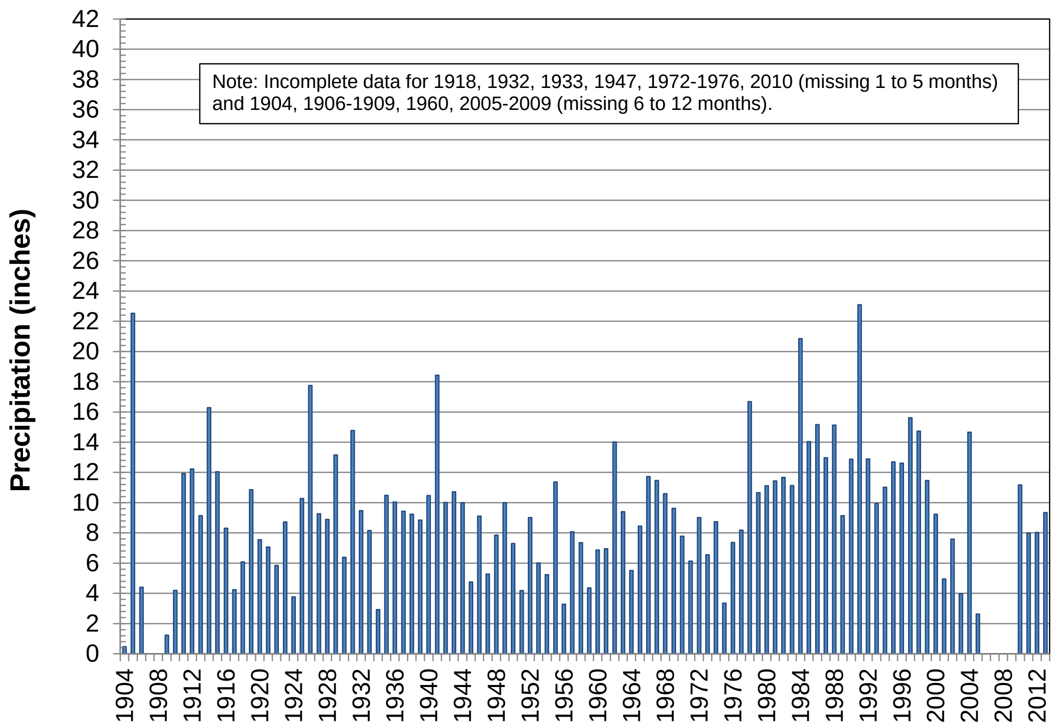
Mountain Park



Orogrande 1 N



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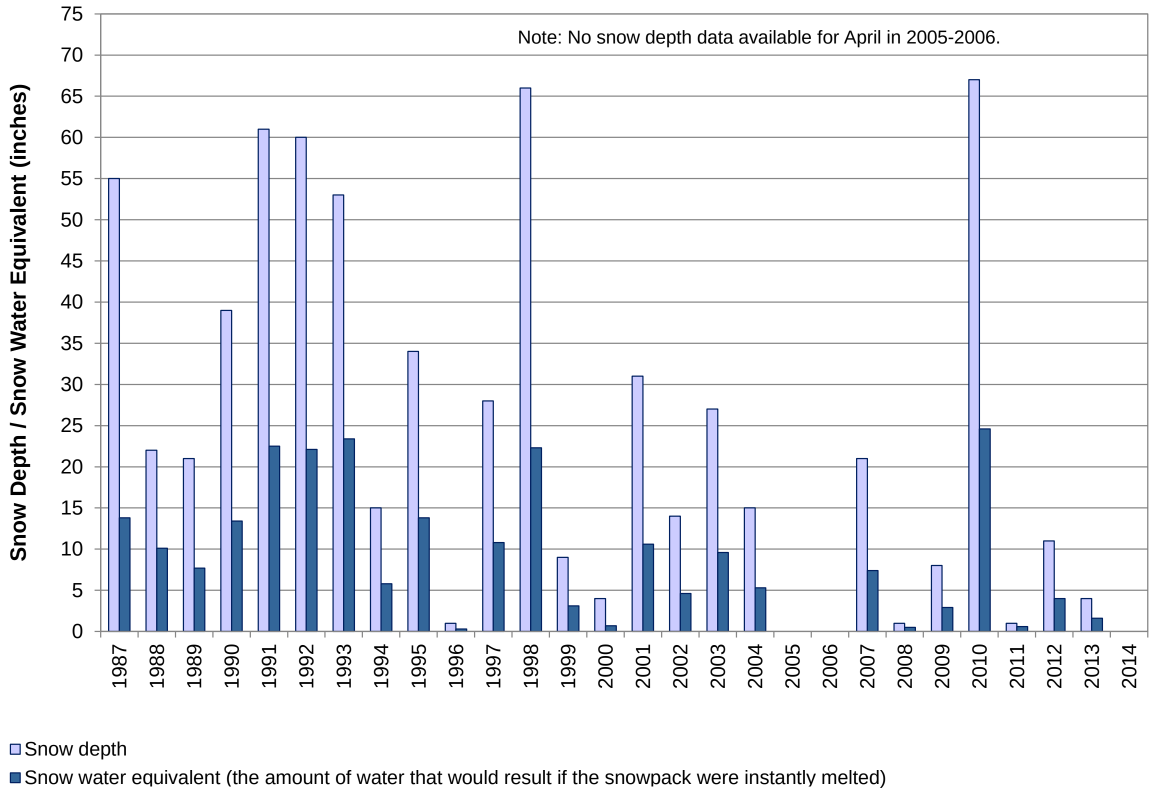
TULAROSA-SACRAMENTO-SALT BASINS
REGIONAL WATER PLAN 2016

Annual Precipitation, Mountain Park and Orogrande 1 N Climate Stations

Figure 5-4

Sierra Blanca Snow Course and Aerial Marker



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

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TULAROSA-SACRAMENTO-SALT BASINS
REGIONAL WATER PLAN 2016

Snow Depth and
Snow Water Equivalent for April

Figure 5-5

Table 5-3. Palmer Drought Severity Index Classifications

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

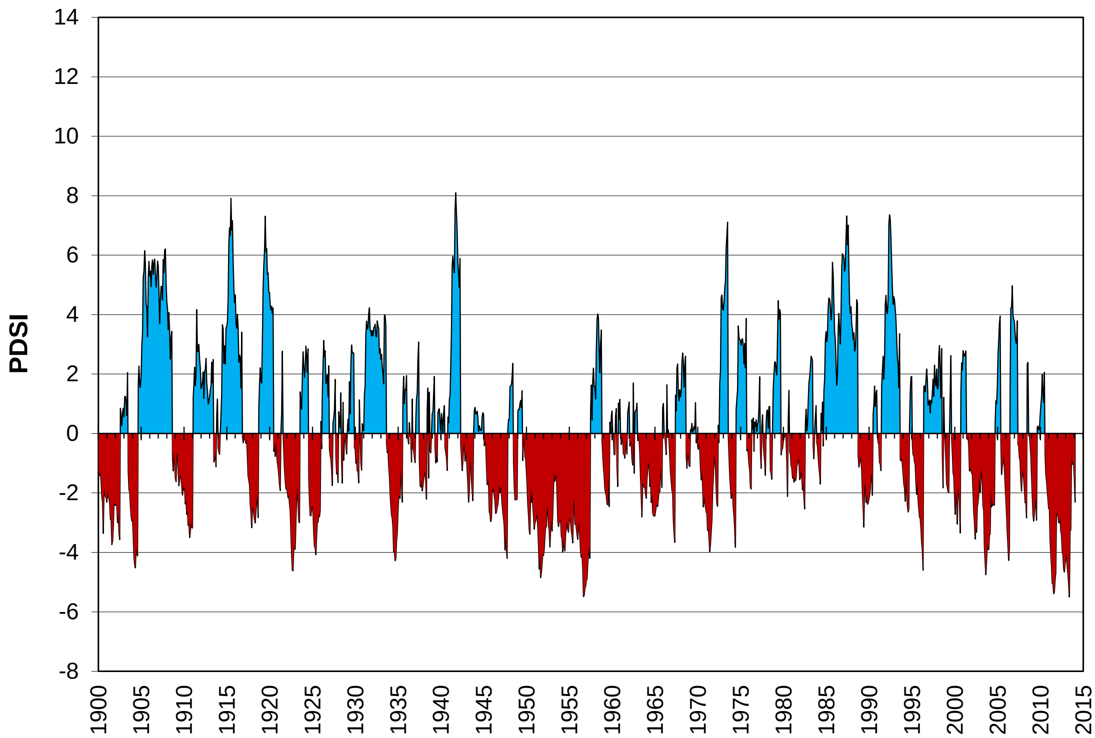
The PDSI is calculated for climate divisions throughout the United States. Lincoln County falls primarily within New Mexico Climate Division 5 (the Central Valley Climate Division) and Division 6 (the Central Highlands Climate Division), while Otero County falls primarily within New Mexico Climate Division 8 (the Southern Desert Climate Division); small portions of Climate Division 7 (the Southeastern Plains Climate Division) are present on the eastern edge of the region (Figure 5-1). Figure 5-6a and 5-6b show the long-term PDSI for these four divisions. Of interest are the large variations from year to year in all four divisions, which are similar in pattern though not necessarily in magnitude.

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

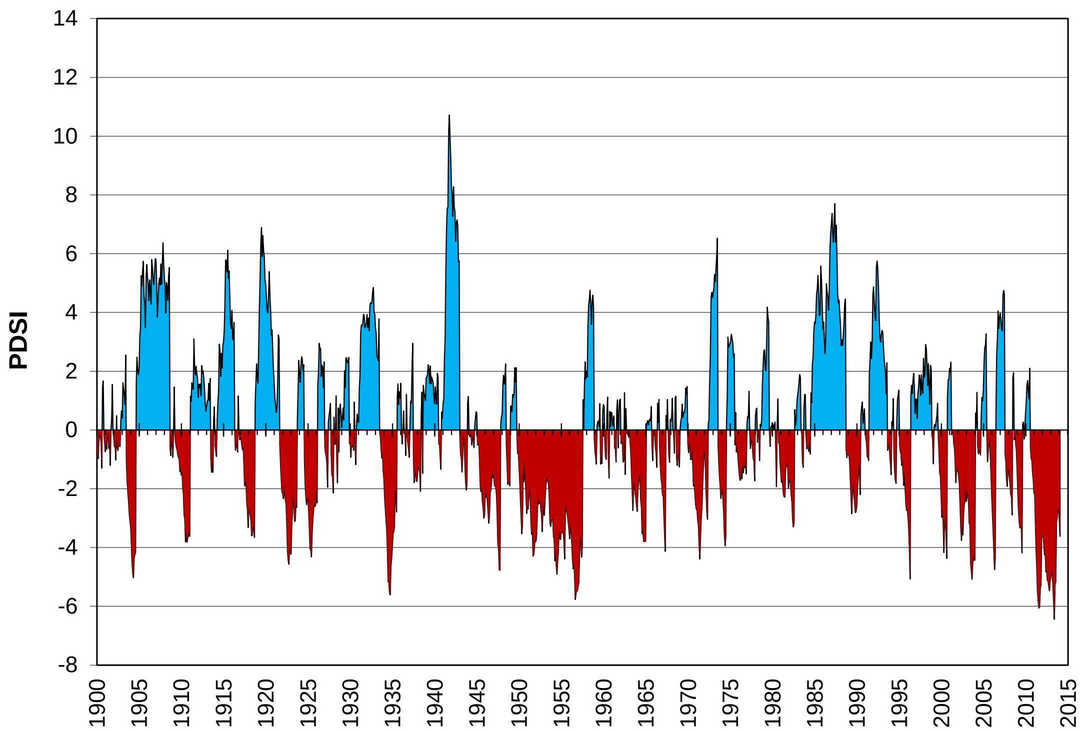
- *El Niño/La Niña:* El Niño and La Niña are characterized by a periodic warming and cooling, respectively, of sea surface temperatures across the central and east-central equatorial Pacific. Years in which El Niño is present are more likely to be wetter than average in New Mexico, and years with La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

Climate Division 5



Climate Division 6



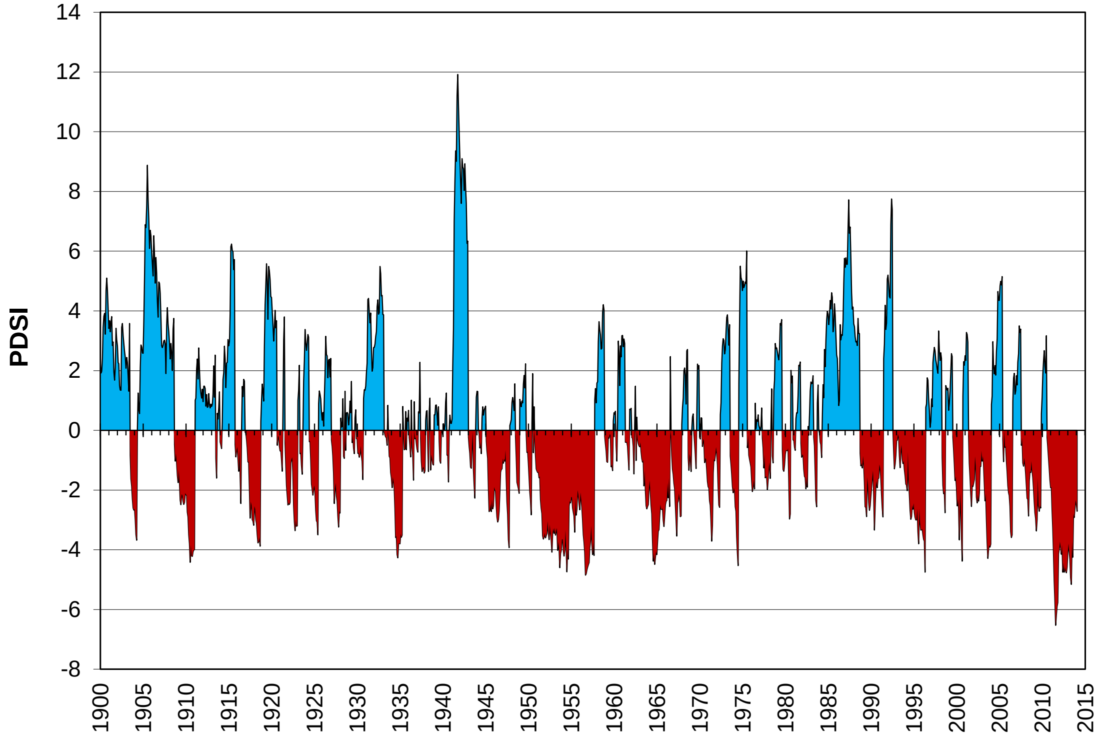
Note: Blue indicates wetter than average conditions and red indicates drier than average conditions, as described on Table 5-3.

TULAROSA-SACRAMENTO-SALT BASINS
REGIONAL WATER PLAN 2016

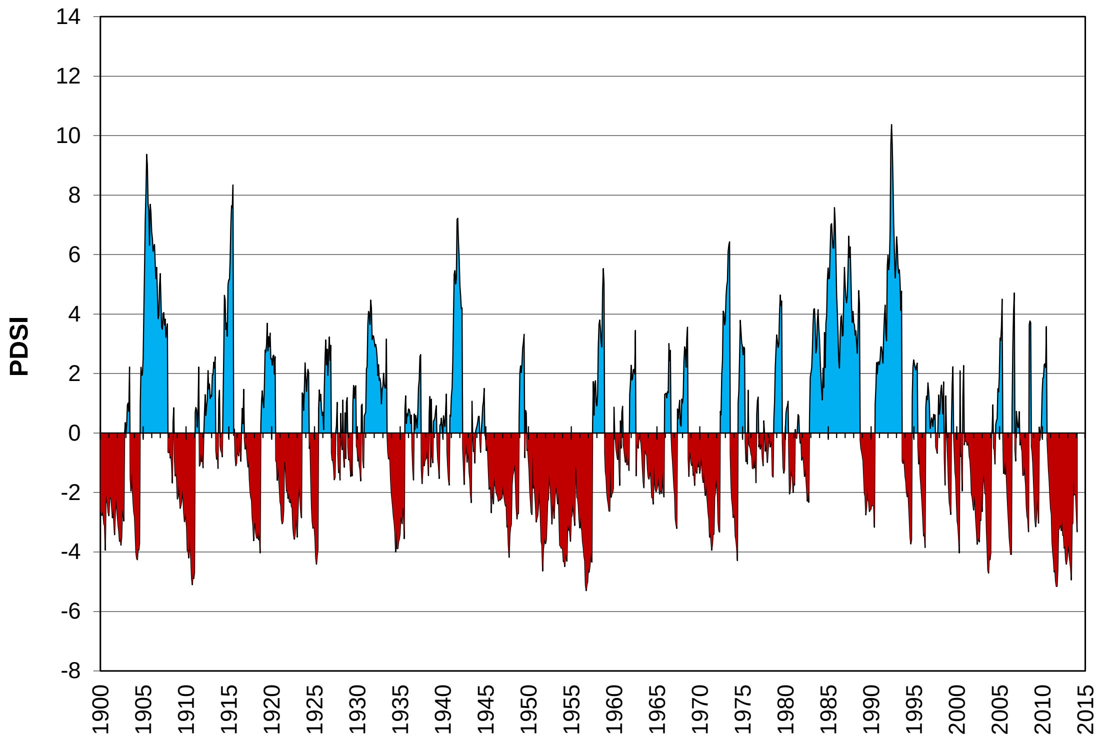
Palmer Drought Severity Index
New Mexico Climate Divisions 5 and 6

Figure 5-6a

Climate Division 7



Climate Division 8



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

TULAROSA-SACRAMENTO-SALT BASINS
REGIONAL WATER PLAN 2016

Palmer Drought Severity Index
New Mexico Climate Divisions 7 and 8

Figure 5-6b

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- *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.

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.

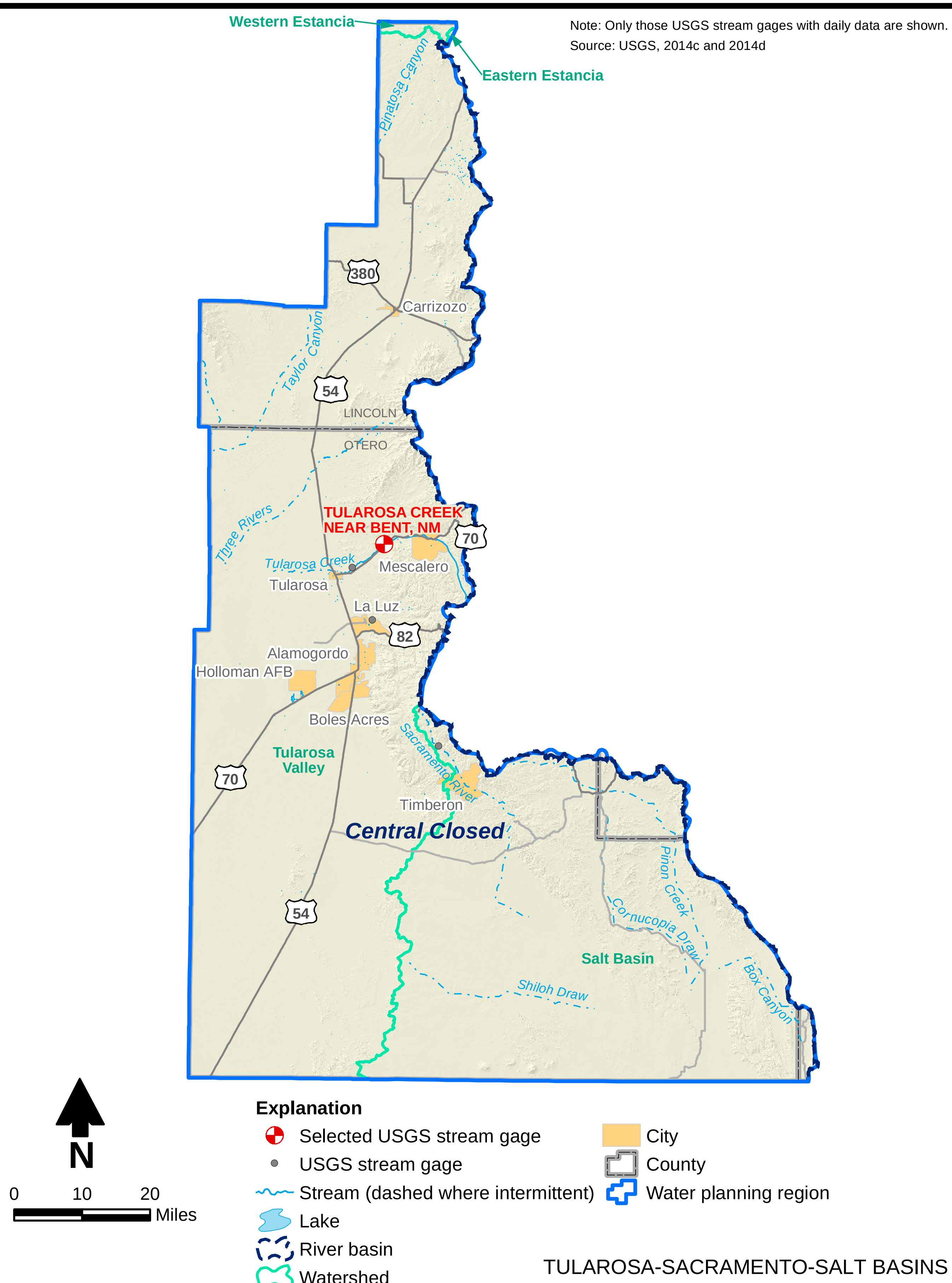
5.2 Surface Water Resources

Surface water supplies approximately 30 percent of the water currently diverted in the Tularosa-Sacramento-Salt Basins Water Planning Region; its primary uses are for public water supply and irrigated agriculture, with small amounts also being used for commercial and livestock purposes. The primary waterways from which water is diverted for irrigation, municipal, and domestic use in the region are Three Rivers, Tularosa Creek, La Luz-Fresnel Canyon, Alamo Canyon, and Sacramento River (Livingston and JSAI, 2002). Surface water, in conjunction with groundwater, supplies the communities of:

- Tularosa (Tularosa Creek)
- Alamogordo (Fresnal Canyon stream and springs, Upper and Lower Maruche Springs, Upper and Lower Springer Springs, Alamo Canyon, Caballero Canyon Springs, Crocket Springs, Gordon Canyon Springs and Bonito Lake [in the Hondo Basin])
- Carrizozo (Bonito Lake in the Hondo Basin)
- Timberon (five springs)
- Holloman (Bonito Lake in the Hondo Basin)
- La Luz (La Luz and Fresnal streams)
- Cloudcroft (Springs in the Peñasco Basin, outside of planning area)

Major surface drainages (including both perennial and intermittent streams) and watersheds in the planning region are shown on Figure 5-7. When evaluating surface water information, it is important to note that streamflow does not represent available supply, as there are also water rights limitations. The administrative water supply discussed in Section 5.5 is intended to represent supply considering both physical and legal limitations. The information provided in this section is intended to illustrate the variability and magnitude of streamflow, and particularly the relative magnitude of streamflow in recent years.

Tributary flow is not monitored in every subwatershed in the planning region. However, streamflow data have been collected by the U.S. Geological Survey (USGS) and various cooperating agencies at a few 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 the Tularosa-Sacramento-Salt Basins region, only one gage has more than 10 years of record: Tularosa Creek near Bent, New Mexico.



TULAROSA-SACRAMENTO-SALT BASINS
REGIONAL WATER PLAN 2016

Major Surface Drainages, Stream Gages, Reservoirs, and Lakes

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Figure 5-7

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**
Otero County								
Tularosa Creek Near Bent, NM	08481500	33.1448889	–105.897903	5,450	120	1,000	1/1/1948	Present
Rio Tularosa Near Tularosa, NM	08482000	33.0931397	–105.976935	4,800	140	—	10/1/1938	9/30/1947
La Luz Creek at La Luz, NM	08484500	32.9823098	–105.925545	—	63	—	9/9/1982	2/13/1989
Sacramento R Near Sunspot, NM	08492900	32.7139836	–105.7547	—	13	—	7/10/1984	9/30/1989

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: Livingston and JSAI, 2002; USGS, 2014a

USGS = U.S. Geological Survey

ft amsl = Feet above mean sea level

sq mi = Square miles

— = 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	
Otero County				
Tularosa Creek Near Bent, NM	5,850	8,905	17,158	59

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

In addition to the 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 the Tularosa Creek station and Figure 5-8 shows the minimum and median annual water yield for this gage. Figure 5-9 shows the annual water yield from the beginning of the period of record through 2013 for the gage.

No lakes or reservoirs with a storage capacity greater than 5,000 acre-feet are present in the planning region (Figure 5-7); therefore Table 5-6 is not included in this RWP update. Bonito Lake, although not located within the region, is operated by the City of Alamogordo and supplies municipal water for Alamogordo, Holloman Air Force Base (AFB), Carrizozo, Nogal, and Fort Stanton (Livingston and JSAI, 2002).

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 La Luz-Fresnal East Reservoir and La Luz-Fresnal North & South Reservoir dams are operated by the City of Alamogordo and are classified as having high hazard potential. Both dams are perimeter embankment dams and hold raw water prior to treatment at the La Luz Water Treatment Plant. The combined capacity of the reservoir totals 180 million gallons (552 acre-feet) (JSAI, 2006).

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
Otero County													
Tularosa Creek Near Bent, NM	59	897	809	875	806	756	657	784	931	800	802	816	884

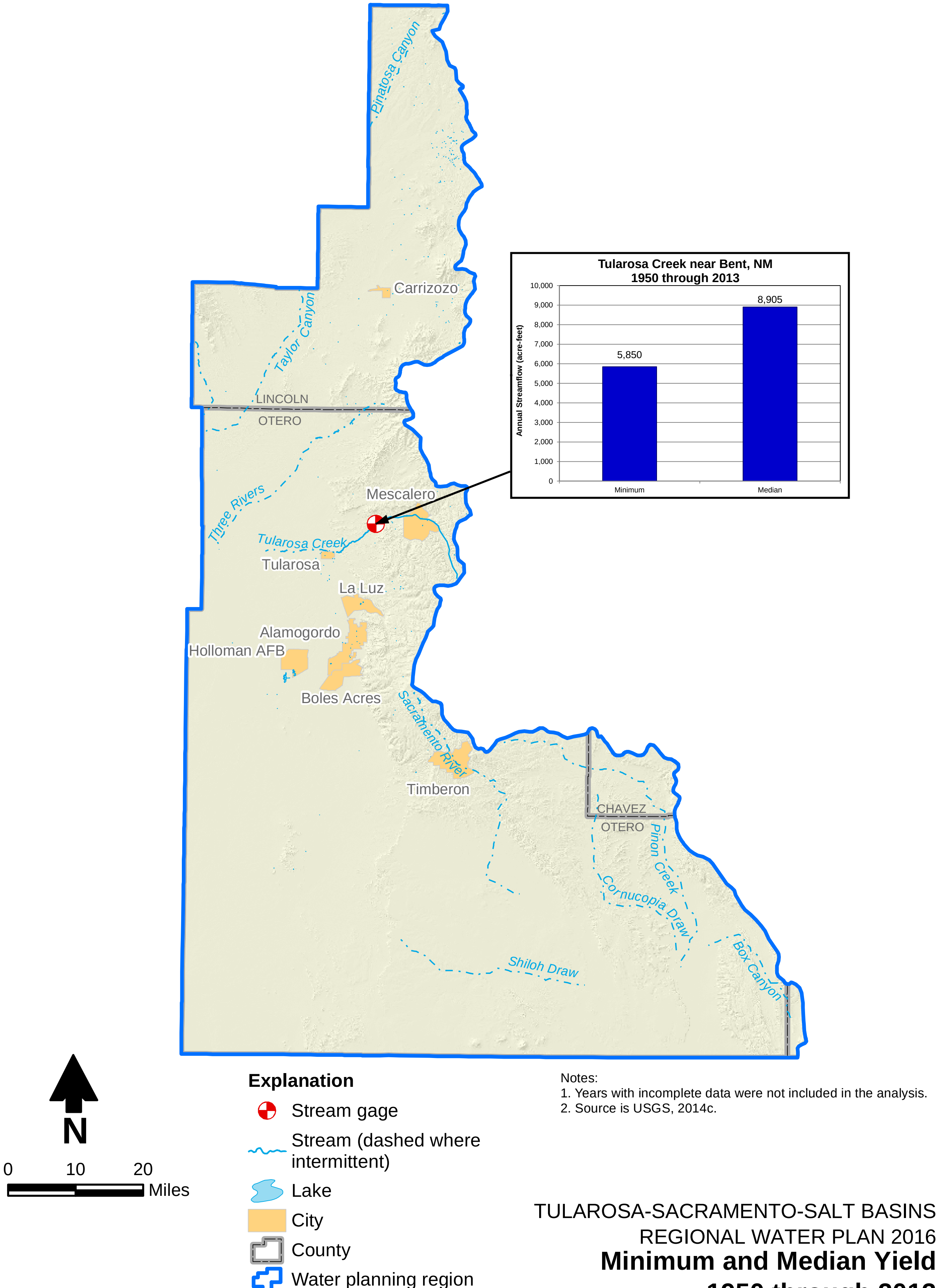
Source: USGS, 2014c

[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



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

TULAROSA-SACRAMENTO-SALT BASINS
REGIONAL WATER PLAN 2016

Minimum and Median Yield
1950 through 2013

Figure 5-8

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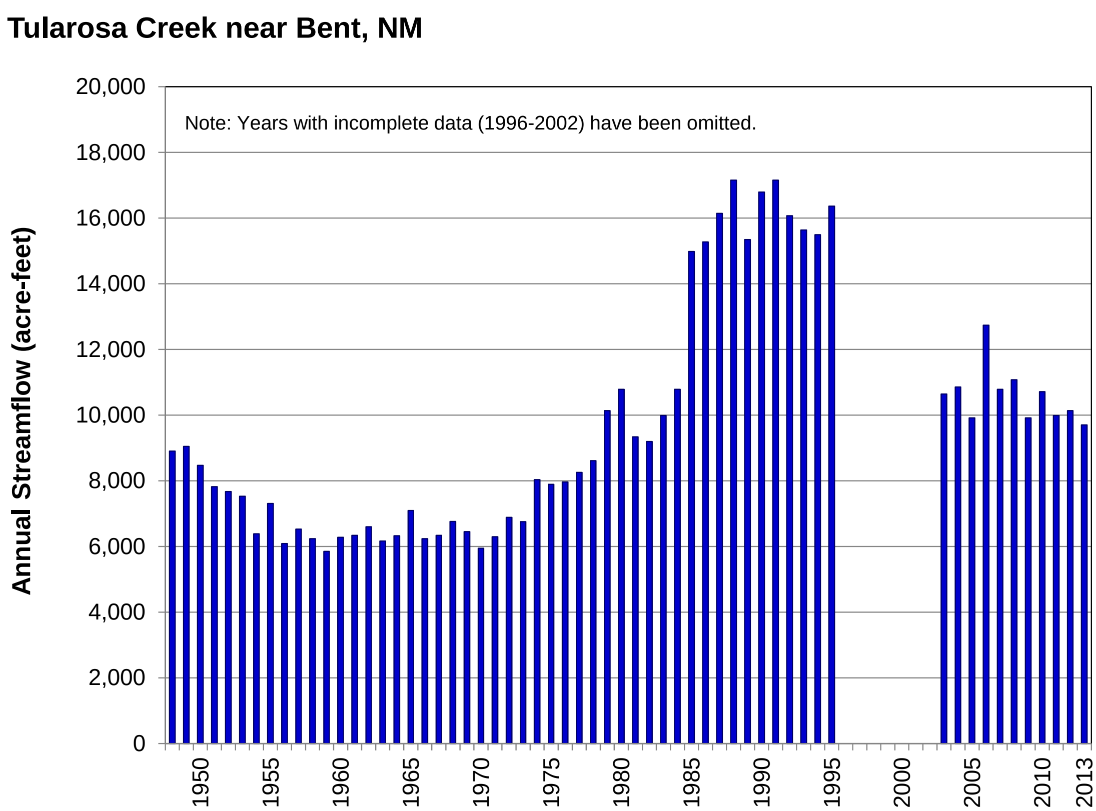


TULAROSA-SACRAMENTO-SALT BASINS
REGIONAL WATER PLAN 2016

Annual Streamflow for
Selected Gaging Station on Tularosa Creek

Figure 5-9

Table 5-7. Dams with Dam Safety Deficiency Rankings

Dam	Condition Assessment [a]	Deficiency	Hazard Potential [b]	Estimated Cost to Repair ($)
Otero County				
La Luz-Fresnal East Reservoir	Poor	Lack of design information	High	100,000
La Luz-Fresnal North & South Reservoirs	Poor	Lack of design information	High	100,000

Source: NMOSE, 2014b

[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.

In years 2014 and 2015, both dams' conditions were classified as "poor" as a result of "lack of design information on file with the NMOSE. Neither of these dams had operation and maintenance (O&M) manuals or an emergency action plan (EAP) (NMOSE, 2014). However, in April 2015 the NMOSE received second submittals of O&M manuals in April 2015, along with Hydrologic Analysis Reports, and review of those documents is pending. The Hydrologic Analysis Report is the "first step in preparing an EAP" (NMOSE, 2015a, 2015b).

5.3 Groundwater Resources

Groundwater is a primary source of water for the region and accounted for about 70 percent of all water diversions in the year 2010 (Longworth et al., 2013). Groundwater is important to the region as it provides a significant portion or the sole source of drinking water for many communities, including many of the small drinking water systems in the region, and it also supplies much of the irrigated agriculture in the region.

5.3.1 Regional Hydrogeology

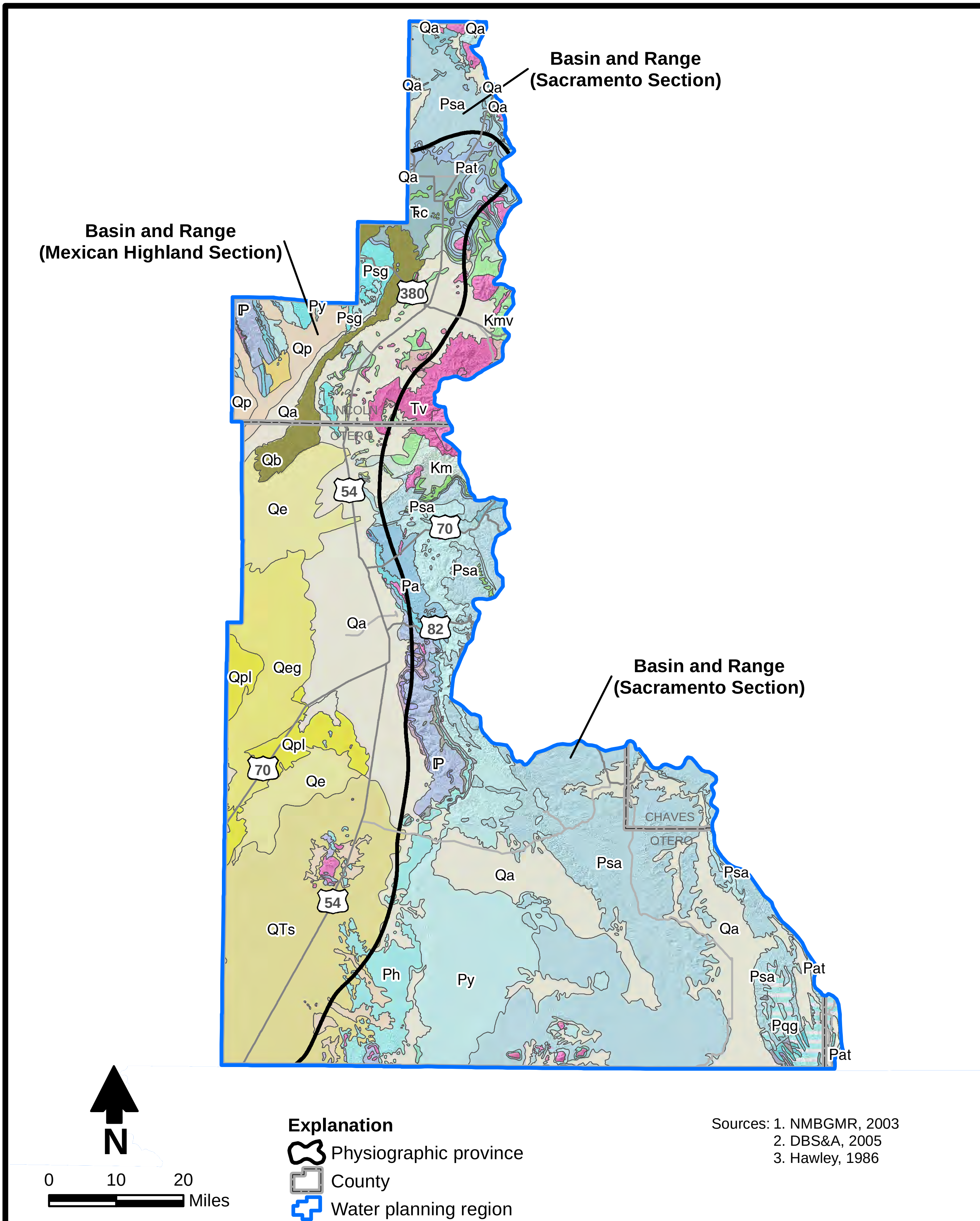
The geology that controls groundwater occurrence and movement within the planning region was described in the accepted *Tularosa Basin and Salt Basin Regional Water Plan 2000-2040* (Livingston and JSAI, 2002), based on studies by Hawley (1978), Orr and Myers (1986), Kelley and Thompson (1964), McLean (1970), Hendrickson (1949), Griswold (1959), Bjorklund (1957), Kelley (1971), Mayer (1995), Cooper (1965), and Rao (1986). 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.

Two physiographic regions exist within the planning region (Hawley 1986):

- 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.

As reported in the accepted regional water plan (Livingston and JSAI, 2002), groundwater in the region is sourced from the basin-fill aquifer and from the bedrock aquifer. The basin-fill aquifer supplies most of the groundwater in the region, but the bedrock aquifer also provides water in the northern Tularosa Basin and the Salt Basin. Groundwater is the primary source of water for users in the northern and western Tularosa Basin. Users in the Salt Basin and the eastern portion of the Tularosa Basin rely on both surface water and groundwater.



TULAROSA-SACRAMENTO-SALT BASINS
REGIONAL WATER PLAN 2016
Geology and Physiographic Provinces

Figure 5-10a

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Geology Explanation

- IP - Pennsylvanian rocks undivided
- IPps - Panther Seep Formation
- Kdg - Dakota Group
- Kl - Lower Cretaceous, undivided
- Km - Mancos Shale
- Kmd - Intertongued Mancos Shale and Dakota Sandstone of west-central New Mexico
- Kmv - Mesaverde Group
- MD - Mississippian and Devonian rocks, undivided
- M€ - Mississippian through Cambrian rocks, undivided
- O€ - Ordovician and Cambrian rocks, undivided
- PIP - Permian and Pennsylvanian rocks, undivided
- Pa - Abo Formation
- Pal - Lower part of Abo Formation
- Pat - Artesia Group
- Pau - Upper part of Abo Formation
- Pb - Bursum Formation
- Pcc - Cherry Canyon Formation
- Pco - Cutoff Shale
- Pg - Glorieta Sandstone
- Ph - Hueco Formation (or Group)
- Pqg - Queen and Grayburg Formations
- Psa - San Andres Formation
- Psg - San Andres Limestone and Glorieta Sandstone
- Psr - Seven Rivers Formation
- Psy - San Andres, Glorieta, and Yeso Formations, undivided
- Pvp - Victorio Peak Limestone
- Py - Yeso Formation
- QTs - Upper Santa Fe Group
- QTsf - Santa Fe Group, undivided
- Qa - Alluvium
- Qb - Basaltic to andesitic lava flows
- Qe - Eolian deposits
- Qeg - Gypsiferous eolian deposits
- Qp - Piedmont alluvial deposits
- Qpl - Lacustrine and playa deposits
- SO€ - Silurian through Cambrian rocks, undivided
- Ti - Tertiary intrusive rocks of intermediate to silicic composition
- Tps - Paleogene sedimentary units
- Tv - Middle Tertiary volcanic rocks
- Yg - Mesoproterozoic granitic plutonic rocks
- Ys - Mesoproterozoic sedimentary rocks
- Ꞧc - Chinle Group
- Ꞧm - Moenkopi Formation

Source: NMBGMR, 2003

TULAROSA-SACRAMENTO-SALT BASINS
REGIONAL WATER PLAN 2016
Geology Explanation

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Figure 5-10b

The *Tularosa Basin* is a curved, down-faulted basin that is part of the Rio Grande rift complex of north-south trending extensional features stretching from northern Mexico to southern Colorado (Hawley, 1978). The accepted water plan (Livingston and JSAI, 2002) divided the Tularosa Basin Water Planning Region into four sub-basins based on their hydrogeologic characteristics: (1) northern Tularosa Basin, (2) western half of the southern portion of the Tularosa Basin along the north-south trending Jarilla Fault line, (3) eastern half of the southern portion of the Tularosa Basin, and (4) the Salt Basin. These four sub-basins are briefly summarized below.

The *northern Tularosa Basin* is centered roughly on the Town of Carrizozo in a relatively narrow portion of the basin and at a higher elevation than the rest of the basin. The principal water producing units are the alluvial deposits, the upper and lower Santa Fe Formations, the Mesaverde Group, the Glorieta Sandstone, the San Andres Limestone, and the Yeso Formation. The alluvial deposits and Santa Fe Group are absent in the northern portion and reach thicknesses of 2,000 feet at the southern end of this sub-basin. In the vicinity of Carrizozo, the basin-fill deposits are less than 100 feet thick but very productive where saturated (Livingston and JSAI, 2002). Most of the water in the northern Tularosa Basin has a TDS greater than 1,000 mg/L (Livingston and JSAI, 2002). A recent study conducted by the New Mexico Bureau of Geology and Mineral Resources focused on understanding the groundwater resources in this region by identifying recharge areas and quantities, determining groundwater flow rates and direction, and interpreting the groundwater/surface water interactions that exist in the region (Mamer et al., 2014).

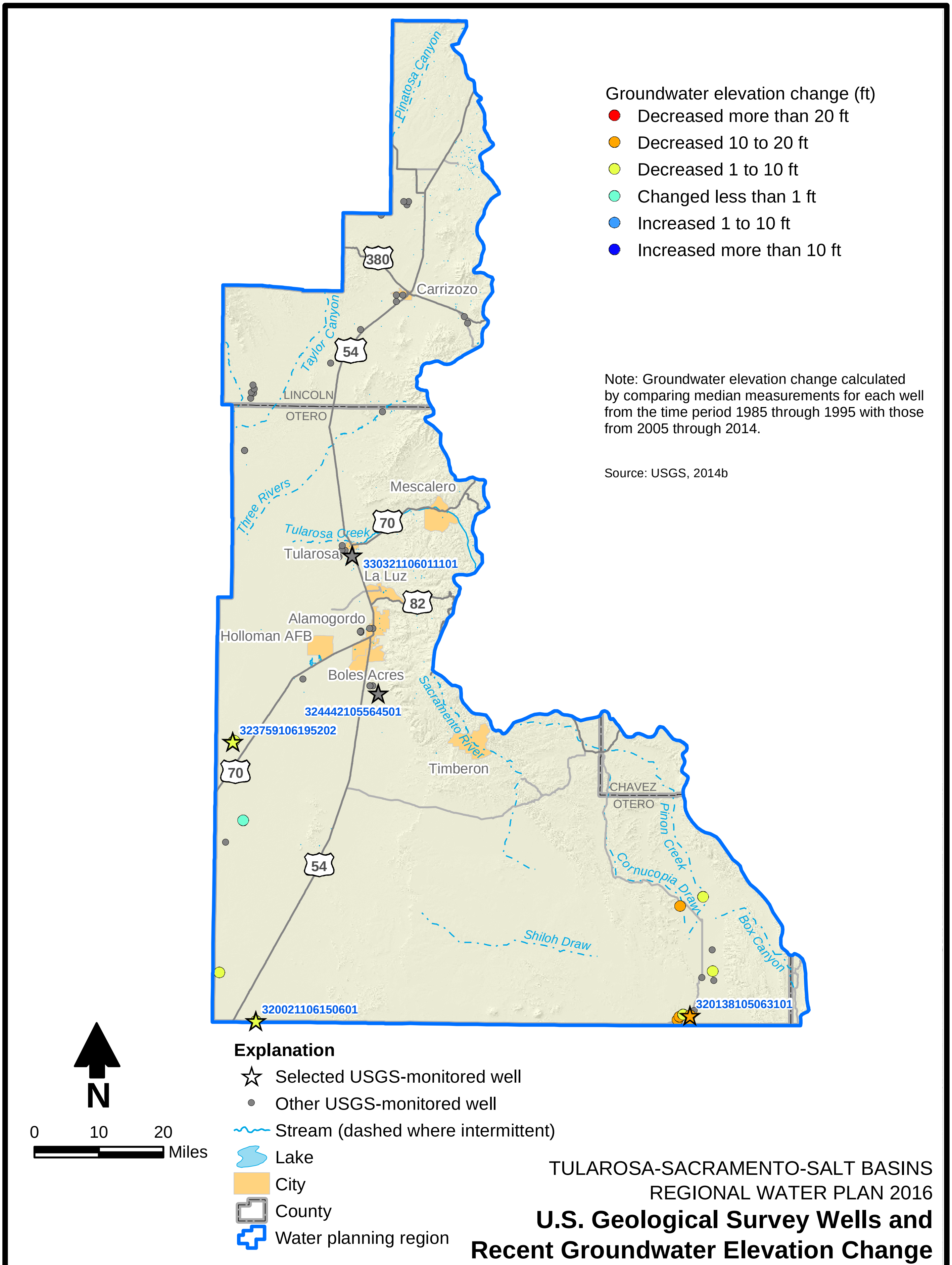
The *western Tularosa Basin* is bounded on the west by the Otero-Doña Ana county line and by the bedrock high of the Jarilla Fault to the east (which is not included in Figure 5-10a, but runs north-south, 1 to 2 miles west of Highway 54). Quaternary-age alluvial, piedmont, eolian, and pluvial deposits cover the basin surface and are underlain by the Santa Fe Group sediments; all are considered basin-fill deposits. Evaporite deposits, dominantly gypsum sands, that have formed the famous dunes of White Sands National Monument, are part of the basin-fill deposits, which been estimated to be more than 4,000 feet thick. The sediments are generally fine-grained and yield small quantities of groundwater with very high TDS concentrations (NMWRRI, 2000). Depth to groundwater at White Sands varies from 1 to 3 feet and groundwater plays an important role in the stabilization of the dunes (Newton et al., 2014; Bourret et al., 2013). Groundwater in the basin fill is highly mineralized with sodium chloride (NMWRRI, 2006), except for pockets of freshwater in alluvial fan deposits (Orr and Myers, 1986).

The *eastern Tularosa Basin* contains basin surficial deposits of Quaternary alluvial, piedmont, eolian, and pluvial units underlain by Santa Fe Group deposits. The Santa Fe Group deposits (sand, pebbles, and cobbles with lesser amounts of clay) are at least 2,500 feet thick and serve as the primary aquifer for the mountain front. Basin fill sediments thin toward the San Andres Mountains where water quality is the best. Water quality degrades away from the mountain front and with increasing depth. Water on the eastern side of the basin fill deposits, while lower in salinity, is characterized by higher sulfate concentrations, whereas on the western edge, the water becomes higher in chloride, particularly around Alamogordo (NMWRRI, 2006). The Sacramento Mountains to the east are composed of heavily folded and faulted Mesozoic and Paleozoic sedimentary units. The Cretaceous-age Dakota Group in the upper portions of the range in the Three Rivers area is the most viable water-bearing unit. In this area the Dakota Group is about 150 feet thick (Griswold, 1959) and is composed mainly of massive to coarsely bedded sandstone. Orr and Myers (1986) mapped the thickness of the saturated freshwater zone in the alluvial fan deposits in the eastern Tularosa Basin. The northern extent of this freshwater zone is at most a mile wide and extends along the mountain front beginning about a mile south of Alamogordo for 3 miles to the south. Thicknesses are generally less than 600 feet, but reach 1,800 feet at the northernmost end east of Bole Acres.

The *Salt Basin* is bordered on the east by the Guadalupe/Broke-off Mountains and on the west by the Hueco Mountains and Otero Mesa. The aquifers in the Salt Basin are comprised of Quaternary-age alluvium, Permian sediments, and Tertiary igneous intrusions. The alluvium and piedmont deposits can be more than 500 feet thick. The principal bedrock aquifer units are the Permian San Andres, Yeso, and Abo Formations. The San Andres is comprised primarily of limestone, with sandstone at the base of the formation where many of the springs in the basin emerge. The Yeso is more heterogeneous than the San Andres Limestone, with alternating layers of sandstone, limestone, dolomite, siltstone, shale, and evaporites (Childers and Gross, 1985). The Yeso Formation is approximately 1,000 feet thick in the southern Sacramento Mountains (Kelley, 1971). About half of the groundwater in the Salt Basin is considered "fresh water" with a TDS of less than 1,000 mg/L (Livingston and JSAI, 2002), and most of that is within the bedrock aquifer. The majority of groundwater in the basin fill aquifer is of marginal quality, with a TDS between 1,000 and 2,000 mg/L (Livingston and JSAI, 2002). Groundwater in the carbonate aquifer is generally very hard and TDS concentrations generally range from 500 to 6,500 mg/L (Huff and Chace, 2006).

5.3.2 Aquifer Conditions

In order to evaluate changes in water levels over time, the USGS monitors groundwater wells throughout New Mexico (Figure 5-11). Hydrographs illustrating groundwater levels versus time, as compiled by the USGS (2014b), were selected for five monitor wells with long periods of record and are shown on Figure 5-12. Many of the wells evaluated show a decline in water levels over time. No active USGS wells are available in the vicinity of Alamogordo and Holloman AFB, but water level declines are a concern and the subject of several studies. Modeling studies predict that the aquifer in the vicinity of Alamogordo and Tularosa will experience an average annual water level decline of more than 2 feet per year over a 10-year planning period due to the full exercise of existing permits and declarations (Emid and Finch, 2011).



TULAROSA-SACRAMENTO-SALT BASINS
REGIONAL WATER PLAN 2016

U.S. Geological Survey Wells and Recent Groundwater Elevation Change

Figure 5-11

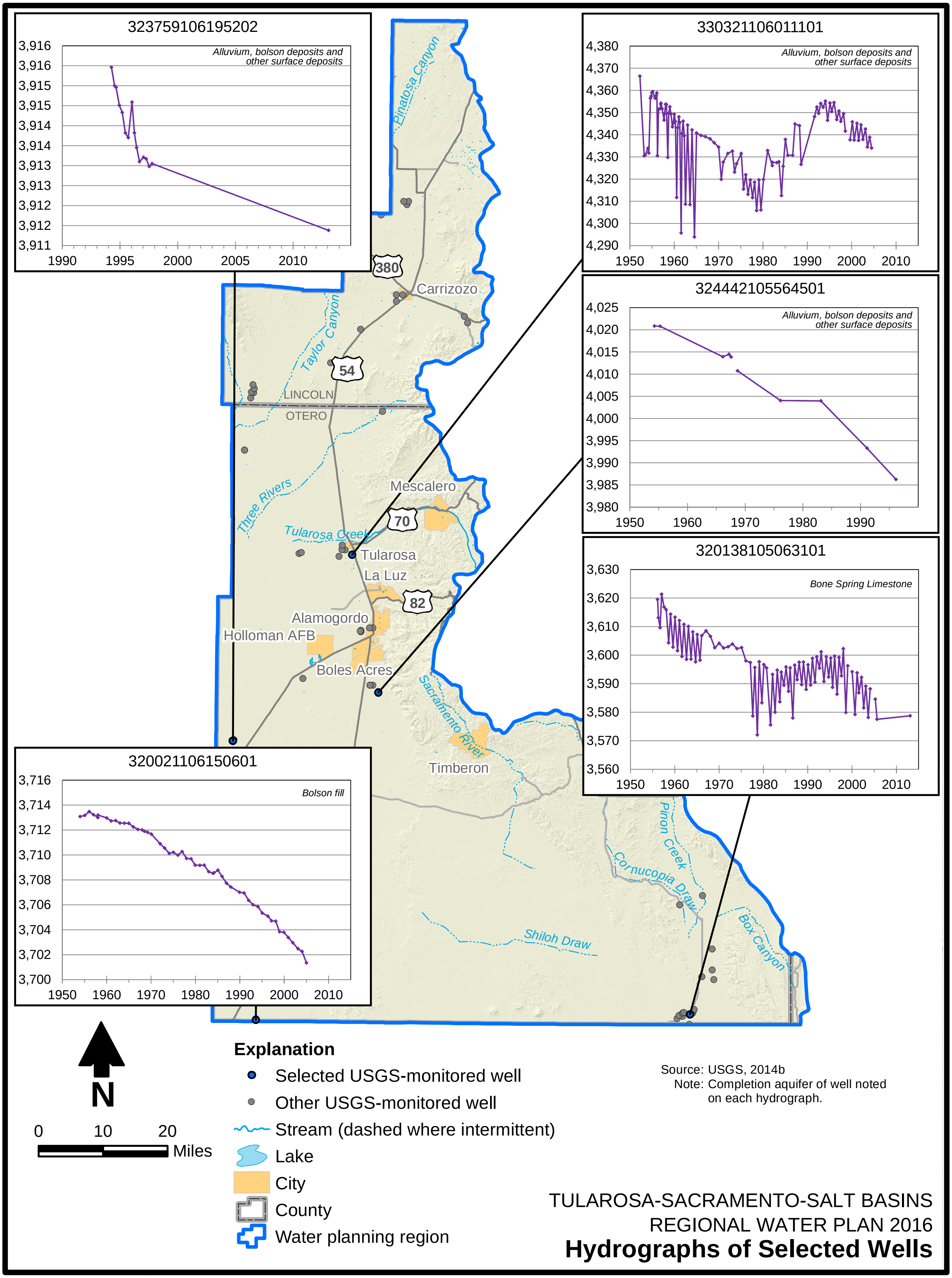


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Figure 5-12

Declines in water levels near the City of Alamogordo well field between 1948 and 1995 were as large as 15 meters under the zero return-flow scenario and 10 meters under the maximum return-flow scenario (Huff, 2004). Using a groundwater model, Huff (2004) simulated water level declines near the City of Alamogordo well field between 1995 and 2040 to be nearly 15 meters. Simulated declines in water levels near the Holloman AFB well fields between 1948 and 1995 and projected declines between 1995 and 2040 are less than 5 meters. The average water level decline in the La Luz well field is approximately 0.5 foot per year (JSAI and Livingston, 2006).

Because water quality is higher in salinity further from the mountain front and with increasing depth, water quality can degrade in the vicinity of heavy pumping centers. JSAI and Livingston (2006) report that water quality diminishes throughout the pumping season in the La Luz well field.

Data regarding recharge of the planning region's aquifers focus primarily on mountain-front recharge. The aquifers in the planning region are generally not recharged through direct rainfall because evaporation far exceeds precipitation in the valleys. However, precipitation in the mountains as rainfall and snow results in significant mountain-front recharge as well as surface water runoff in stream channels. Chemistry, stable isotope, and groundwater age data indicate that a significant portion of groundwater recharge to the Pecos Slope, Roswell Basin, and Salt Basin is derived from subsurface groundwater flow from the high mountain aquifer system in the Sacramento Mountains (Newton et al., 2012). The accepted regional water plan (Livingston and JSAI, 2002) provided the following calculated estimates of recharge in the region:

- Approximately 70 percent of the watershed yield in the *northern Tularosa Basin*, or 30,000 ac-ft/yr, was estimated to result in recharge.

- Recharge in the *western Tularosa Basin* was estimated at 9,291 ac-ft/yr. This is the total mean annual streamflow from the San Andres Mountains estimated by the USGS and represents the probable maximum recharge available.

- In the *eastern Tularosa Basin*, 60 percent of the watershed yield, or 47,099 ac-ft/yr, was estimated to result in recharge.

- Recharge in the *Salt Basin* was estimated at approximately 35,000 ac-ft/yr, primarily from infiltration of precipitation during flash flooding of ephemeral channels (Bjorklund, 1959).

More recent recharge estimates for the region include:

- Mountain front recharge simulated in the NMOSE Administrative Model for the Tularosa Basin is 11,890 ac-ft/yr (Keyes, 2005). This estimate was based on high precipitation periods for 16 watersheds on the east side of the basin. The original model (Morrison, 1989) estimated recharge at 14,847 ac-ft/yr based on 22 watersheds.

- The USGS (Huff, 2004) model of the Tularosa Basin includes recharge on both east and west sides of the basin. Average annual recharge to the basin-fill aquifer was estimated to be approximately 143,000 cubic meters per day (42,315 ac-ft/yr) from the steady-state model calibration.
- The New Mexico Bureau of Mining and Technology (Mamer et al., 2014) estimated recharge in the northern Tularosa Basin to be 67,900 ac-ft/yr, or 8.9 percent of precipitation.

The major well fields in the planning region are:

- La Luz Well Field (City of Alamogordo): Water from these wells requires dilution with surface water to reduce salinity.
- Prather Well Field (City of Alamogordo).
- Boles, San Andres, Douglas, and Escondido/Frenchy well fields (Holloman AFB): These well fields are located in the eastern Tularosa Basin, south of Alamogordo along the eastern edge of the basin-fill aquifer, where well yields are high and water quality is good (Livingston and JSAI, 2002).
- Carrizozo's Municipal Well Field (Carrizozo): This well field consists of two wells, completed in the basin fill of the northern Tularosa Basin, that yield 160 to 260 gallons per minute (gpm) (Livingston and JSAI, 2002).
- Village of Tularosa (two wells).
- Community of La Luz (five wells).

In addition to these well fields, numerous irrigation, domestic, and stock wells are located throughout the planning region.

5.4 Water Quality

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

Surface water quality in the Tularosa-Sacramento-Salt Basins Water Planning Region is evaluated through periodic monitoring and comparison of sample results to pertinent water quality standards. In general, surface water quality ranges from good to poor in the planning region with water quality generally best near the headwater springs. Water quality for some surface waters, such as Tularosa Creek and La Luz Creek, degrades downstream as TDS concentrations increase.

Several reaches of rivers, three springs, and three lakes within the Tularosa and Salt basin watersheds have been listed on the 2014-2016 New Mexico 303(d) list (NMED, 2014a). This list is prepared every two years by NMED and approved by the New Mexico Water Quality Control Commission (NMWQCC) to comply with Section 303(d) of the federal Clean Water Act, which requires each state to identify surface waters within its boundaries that do not meet water quality standards (see Section 4.2.2.1.1).

Section 303(d) further requires the states to prioritize their listed waters for development of total maximum daily load (TMDL) management plans, which document the amount of a pollutant a waterbody can assimilate without violating a state water quality standard and allocates that load capacity to known point sources and nonpoint sources at a given flow. 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

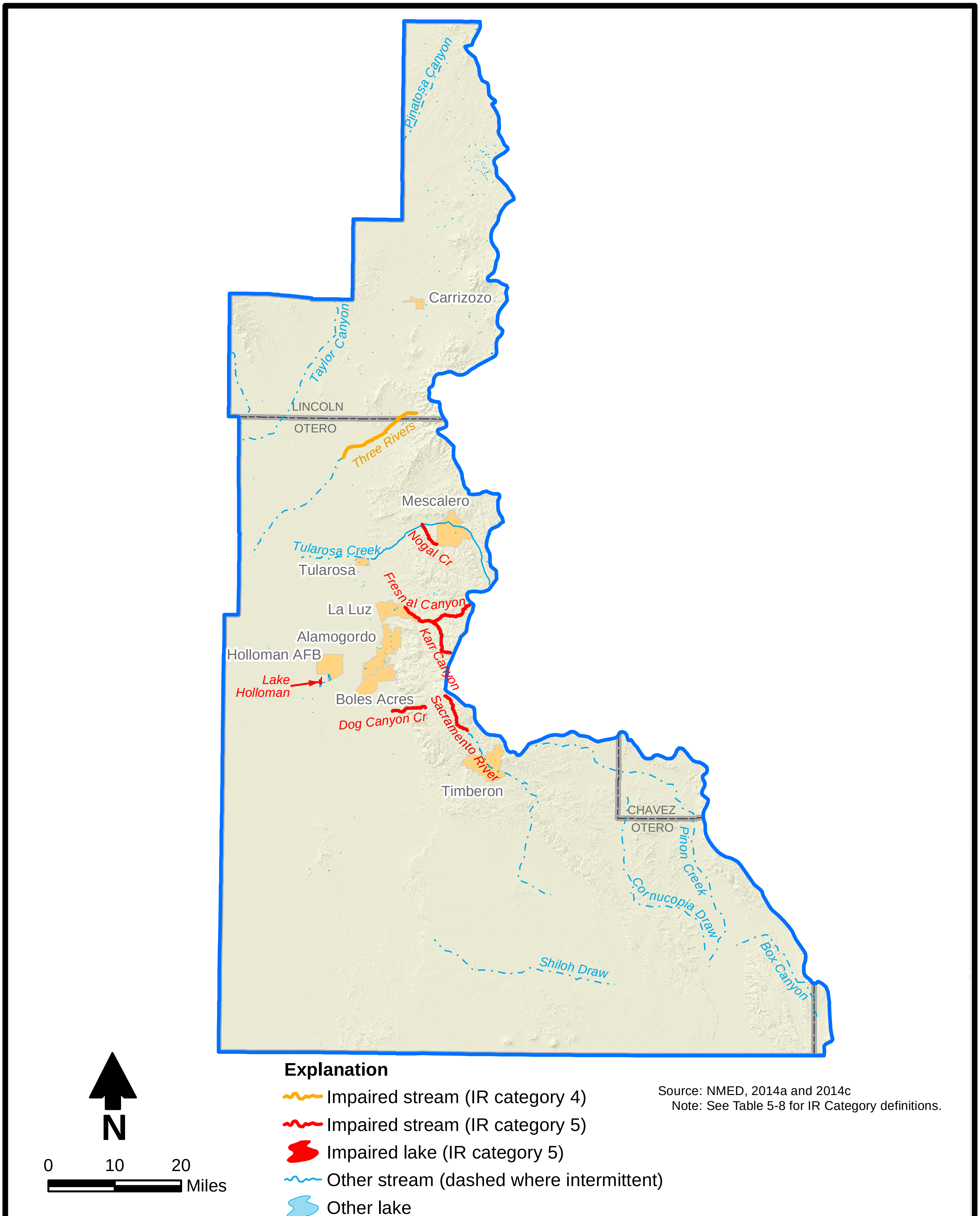
In evaluating the impacts of the 303(d) list on the regional water planning process, it is important to consider that impairments are tied to designated uses. Some problems can be very disruptive to a healthy aquatic community, while others reduce the safety of water recreation or increase the risk of 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.

NMED conducted water quality surveys in the Tularosa Closed Basin (NMED 2009) and the Sacramento Mountains (NMED 2014g). Surface water samples were collected from sampling stations and analyzed for total nutrients, total and dissolved metals, major anions and cations, radionuclides, microbiological collections, temperature, pH, dissolved oxygen, conductivity, and turbidity. These surveys found that water quality met acceptable criteria with the following exceptions:

- E. coli exceeded acceptable levels in Fresnal Canyon, Nogal Creek, and Rio Bonito.
- Arsenic was found in Lake Holloman from unknown sources.
- Turbidity and/or sedimentation in Aqua Chiquita and Karr Canyon.

While not specifically a pollutant, exceedances of standards for temperature and low flow alterations were found in several reaches:

- Temperature: Perennial portions of Dog Canyon Creek, Fresnal Canyon, Nogal Creek, and Rio Bonito
- Low flow alterations: Three Rivers (in Otero and Lincoln counties) and Fresnal Canyon



TULAROSA-SACRAMENTO-SALT BASINS
REGIONAL WATER PLAN 2016
Water Quality-Impaired Reaches

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Figure 5-13

Table 5-8. Total Maximum Daily Load Status of Streams in the Tularosa-Sacramento-Salt Basins Water Planning Region

Page 1 of 3

Waterbody Name (basin, segment)	Assessment Unit ID	Affected Reach (miles [a])	Probable Sources of Pollutant	Uses Not Fully Supported [b]	Specific Pollutant	IR Category [c]
Lincoln County						
Carrizozo Lake	NM-9000.B_027	2 [d]	Not assessed		—	3/3A
Mound Springs	NM-9000.B_086	1 [d]	Not assessed	—	—	3/3A
Salt Creek (Tularosa Valley)	NM-2801_50	47.13	Not assessed	—	—	3/3A
Three Rivers (Perennial prt Hwy 54 to USFS exc Mescalero)	NM-2802_00	14.66	Source unknown	HQColdWAL	Low flow alterations	4C
Otero County						
Dog Canyon Creek (perennial portions)	NM-2801_20	5.84	Source unknown	ColdWAL	Temperature, water	5/5B
Fresnal Canyon (La Luz Creek to Salado Canyon)	NM-2801_41	2.6	Source unknown	ColdWAL PC	Escherichia coli Low flow alterations	5/5C
Fresnal Canyon (Salado Canyon to headwaters)	NM-2801_44	12.9	Source unknown	ColdWAL PC	Temperature, water	5/5C
Karr Canyon (Fresnal Canyon to headwaters)	NM-2801_42	6.57	Source unknown	ColdWAL	Sedimentation/siltation	5/5A
Lake Holloman	NM-9000.B_113	151 [d]	Source unknown	WWAL	Arsenic	5/5A
Lake Lucero (South)	NM-9000.B_069	1988.27 [d]	Not assessed	—	—	3/3A
Lake Stinky	NM-9000.B_070	75.28 [d]	Not assessed	—	—	3/3A
Malpais Springs	NM-9000.B_079	2.2 [d]	Not assessed	—	—	3/3A
Nogal Creek (Tularosa Creek to Mescalero Apache bnd)	NM-2801_10	4.08	Source unknown	ColdWAL PC	Escherichia coli Temperature, water	5/5A

Source: NMED, 2014a

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

[b] Unless otherwise noted.

[c] ColdWAL = Coldwater aquatic life
Cool WAL = Coolwater aquatic life
HQColdWAL = High quality coldwater aquatic life
MCWAL = Marginal coldwater aquatic life
MWWAL = Marginal warmwater aquatic life
PC = Primary contact
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 Tularosa-Sacramento-Salt Basins Water Planning Region
Page 2 of 3

Waterbody Name (basin, segment)	Assessment Unit ID	Affected Reach (miles [a])	Probable Sources of Pollutant	Uses Not Fully Supported [b]	Specific Pollutant	IR Category [c]
Otero County (cont.)						
Sacramento R (Arkansas Canyon to Scott Able Canyon)	NM-2805_00	8.43	Not assessed	—	—	3/3A
Sacramento R (Perennial prt Scott Able Canyon to headwaters)	NM-2805_02	7.2	Not assessed	MCWAL	Sedimentation/siltation	5/5A
Salt Creek (Tularosa Valley)	NM-2801_50	47.13	Not assessed	—	—	3/3A
San Andres Canyon (S. San Andres Canyon to headwaters)	NM-2801_31	4.1	Not assessed	—	—	3/3A
San Andres Canyon (Taylor Ranch Rd to S. San Andres Canyon)	NM-2801_30	3.7	Not assessed	—	—	3/3A
Scott Able Canyon (Sacramento R to road NF-64 abv canyon)	NM-2805_01	1.42	Not assessed	—	—	3/3A
Three Rivers (Perennial prt Hwy 54 to USFS exc Mescalero)	NM-2802_00	14.66	Source unknown	HQColdWAL	Low flow alterations	4C
Tularosa Ck (perennial prt downstream of old US 70 crossing)	NM-2801_00	18.96	Not assessed	—	—	3/3A

Source: NMED, 2014a

[a] Only waterbodies assigned to IR categories 3 and above are included.
[b] Unless otherwise noted.

[c] ColdWAL = Coldwater aquatic life
HQColdWAL = High quality coldwater aquatic life
MCWAL = Marginal coldwater aquatic life
PC = Primary contact
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 Tularosa-Sacramento-Salt Basins Water Planning Region

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

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

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

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

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

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

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

Additionally, Bonito Lake, although not in this Basin, is operated by the City of Alamogordo and supplies municipal water for Alamogordo, Holloman AFB, Carrizozo, Nogal, and Fort Stanton. Water quality in the lake had been very good until recently, when the Little Bear Fire in June of 2012 burned 35,339 acres in Lincoln National Forest. Due to ash, silt, and debris in the lake, Bonito Lake is not currently a viable source of municipal supply (as of 2015), but the City of Alamogordo is in the process of hiring a contractor to remove debris and sediment from the lake (Doydan, 2015).

Groundwater quality is an important issue in the planning region. TDS concentrations in groundwater can be moderate to high, as noted in the 2002 regional water plan. Concentrations of TDS in the Tularosa Basin range from moderate to high, with some of the highest concentrations at the White Sands Missile Range and Holloman AFB-Alamogordo area (NMWRRI, 2000). Most of the recoverable, fresh groundwater (TDS below 1,000 mg/L) is in the eastern Tularosa Basin and the Salt Basin; however, these resources are limited.

Several types and sources of contaminants that have the potential to impact either surface or groundwater quality in the future 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 a National Pollutant Discharge Elimination System (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/). One permitted discharge is a wastewater treatment plant in Cloudcroft and does not necessarily pose a significant water quality problem. The other NPDES permit is for Holloman AFB for its wastewater treatment plant and is a federal NPDES permit. According to the *Draft Environmental Assessment for Lake Holloman Recreational Development*, treated wastewater would be diverted solely to Lagoon G, which should have no significant impact (Holloman AFB, 2009).

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

The U.S. EPA (2014) lists one Superfund site in the planning region: the Cimarron Mining Corporation in Carrizozo (Table 5-11). Leachate from mine waste is a concern for both surface water and groundwater supplies. Contaminants of concern at this site are cyanide in groundwater and lead in soil and sediment. Remedial actions for soil and groundwater have taken place at this site, and NMED is continuing operations and maintenance activities as well as groundwater quality monitoring (U.S. EPA, 2014).

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

5.4.1.3 Leaking Underground Storage Tanks

Leaking underground storage tank (UST) sites present a potential threat to groundwater, and the NMED maintains a database of registered USTs. Many of the facilities included in the UST database are not leaking, and even leaking USTs may not necessarily have resulted in groundwater contamination or water supply well impacts. These USTs could, however, potentially impact groundwater quality in and near the population centers in the future. UST sites in the Tularosa-Sacramento-Salt Basins 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).

Table 5-9. Municipal and Industrial NPDES Permittees in the Tularosa-Sacramento-Salt Basins Water Planning Region

Permit No	Municipality/Industry [a]	Permit Type [b]
Otero County		
NM0023370	Cloudcroft, Village of	Municipal (POTW)
NM0029971	Holloman Air Force Base [c,d]	Federal

Source: NMED, 2016c

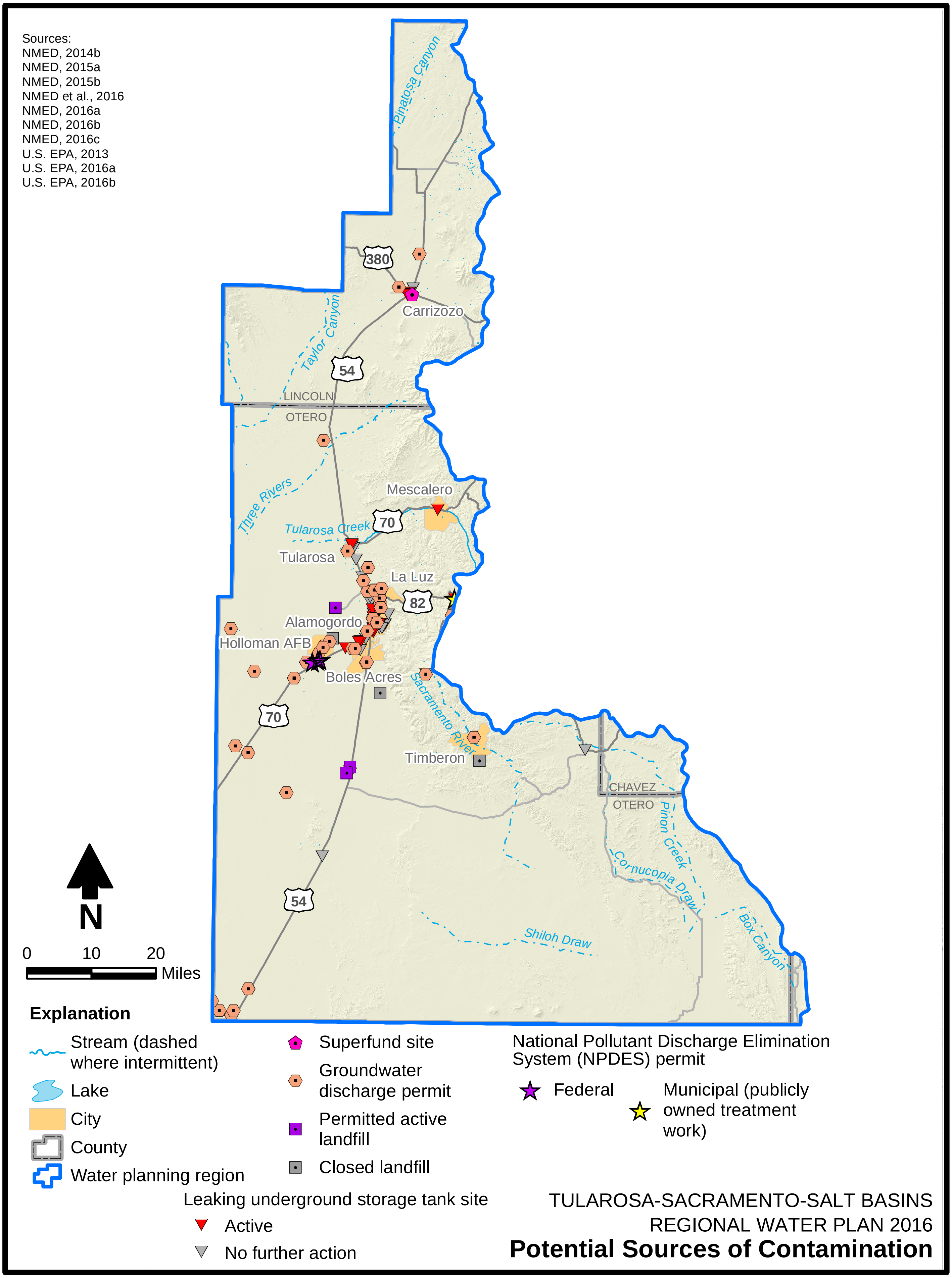
[a] Names appear as listed in the NMED database.

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

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

[d] NMED lists multiple outfall locations

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



TULAROSA-SACRAMENTO-SALT BASINS
REGIONAL WATER PLAN 2016
Potential Sources of Contamination

Figure 5-14

Table 5-10. Groundwater Discharge Permits in the Tularosa-Sacramento-Salt Basins Water Planning Region

Page 1 of 2

County	Facility Name [a]	Permit No.	Status [b]	Permitted Discharge Amount (gpd)
Lincoln	Carrizozo (Town of) Municipal Wastewater Treatment Plant	DP-1297	Active	180,000
	Three Rivers Composting	DP-1833	Active	—
Otero	Alamogordo Brackish Water RO Plant	DP-1827	Active	350,000
	Alamogordo (City of) - Sludge Disposal	DP-806	Active	49,000
	Alamogordo Public Schools	DP-1757	Active	500,000
	Alamogordo Water Reclamation Facility	DP-220	Active	5,000,000
	Bandelier National Monument	DP-1018	Active	21,120
	Boot Hill RV Resort LLC	DP-1636	Active	7,600
	Brackish Groundwater National Desalination Research Facility (BGNDRF)	DP-1472	Active	107,000
	Datts-east	DP-594	Active	3,300
	Eileen Acres Service Corporation	DP-398	Active	41,310
	Holloman Air Force Base	DP-997	Active	—
	Holloman Air Force Base	DP-1479	Active	310,000
	Holloman Air Force Base	DP-1127	Active	450,000
	Holloman Air Force Base	DP-1446	Active	213,000
	Juniper Mobile Home Park	DP-470	Active	5,000
	La Luz Elementary School	DP-294	Active	5,614
	National Solar Observatory	DP-1042	Active	10,000
	Otero (County of) - Prison Facility	DP-1400	Active	330,000

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

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

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

gpd = Gallons per day

— = Not listed on GWQB web site

Table 5-10. Groundwater Discharge Permits in the Tularosa-Sacramento-Salt Basins Water Planning Region
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County	Facility Name [a]	Permit No.	Status [b]	Permitted Discharge Amount (gpd)
Otero (cont.)	Rhino Environmental Services - Landfill	DP-1051	Active	120,000
	Rosa Mora	DP-1732	Active	—
	Roto Rooter/AAA Pumping Service	DP-965	Active	100
	Sam's Place Trailer Court	DP-1547	Active	6,050
	ST Services	DP-523	Active	36,000
	Timberon RV Park	DP-92	Active	4,000
	Tularosa Wastewater Treatment Facility	DP-82	Active	500,000
	Valley View Subdivision	DP-327	Active	9,900
	White Sands Missile Range	DP-297	Active	15,000
	White Sands Missile Range	DP-492	Active	4,000
	White Sands National Monument	DP-1642	Active	10,000

Source: NMED, 2014b, 2016b, NMED et al., 2016
[a] Names appear as listed in the NMED database.
[b] Facilities with an NMED designated status of active or pending are shown. Inactive facilities are not included; they can be identified on the NMED website.

gpd = Gallons per day
— = Not listed on GWQB web site

Table 5-11. Superfund Sites in the Tularosa-Sacramento-Salt Basins Water Planning Region

Site Location	Site Name [a]	Site ID	EPA ID	Status [b]
Lincoln County				
Carrizozo, NM	Cimarron Mining Corp.	NMD980749378	600897	NPL

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

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

[b] NPL = National Priorities List

Table 5-12. Leaking Underground Storage Tank Sites in the Tularosa-Sacramento-Salt Basins Water Planning Region

City [a]	Release/Facility Name [b,c]	Release ID	Facility ID	Physical Address [c]	Status [d]
Lincoln County					
Carrizozo	Allsups 132	3240	26532	12361 W Central Ave	Aggr Cleanup Completed, Resp Party
	Carrizozo Fina	3131	27258	301 Central	Cleanup, Responsible Party
	Ortiz Bros Chevron	1324	29815	Hwy 54 and 12th St	Investigation, Responsible Party
Otero County					
Mescalero	Big Chief Store	3203	26920	24365 Hwy 70 W	Aggr Cleanup Completed, Resp Party
	Chevron #76082	476	26297	Hwy 70	Referred to US EPA
Tularosa	Big Chief Store	3203	26920	24365 Hwy 70 W	Aggr Cleanup Completed, Resp Party
	Chevron #76082	476	26297	Hwy 70	Referred to US EPA
	Big Chief Store	3203	26920	24365 Hwy 70 W	Aggr Cleanup Completed, Resp Party
	Chevron #76082	476	26297	Hwy 70	Referred to US EPA
	Big Chief Store	3203	26920	24365 Hwy 70 W	Aggr Cleanup Completed, Resp Party
	Chevron #76082	476	26297	Hwy 70	Referred to US EPA

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 Tularosa-Sacramento-Salt Basins Water Planning Region
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City [a]	Release/Facility Name [b,c]	Release ID	Facility ID	Physical Address [c]	Status [d]
Otero County (cont.)					
La Luz	La Luz Market A	2968	28994	21 Alamo St	Pre-Investigation, Confirmed Release
Cloudcroft	Cloudcroft Texaco	2970	27431	Hwy 82	Cleanup, Responsible Party
Alamogordo	A Plus Auto Parts	4522	26332	110 S White Sands	Cleanup, Responsible Party
	Allsups 312	4689	882	1520 White Sands Blvd	Pre-Investigation, Confirmed Release
	Bar F 15	1874	26846	601 First St	Aggr Cleanup Completed, Resp Party
	Bekins Storage	277	26882	1505 Hwy 70 West	Aggr Cleanup Completed, Resp Party
	Bell Gas 183/Al Fed Svng	2899	956	508 Tenth St	Cleanup, Responsible Party
	Downtown Chevron	3233	1203	620 White Sands	Cleanup, Responsible Party
	Express Lane	3619	1225	2101 N White Sands Blvd	Cleanup, Responsible Party
	H & G Mini-Mart	2141	28431	829 S Whitesands Blvd	Aggr Cleanup Completed, Resp Party
	Holloman Fina	3588	28583	20872 US Highway 70 West	Cleanup, Responsible Party
	Midtown Shell	748	1522	723 Whitesands Blvd	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

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Table 5-12. Leaking Underground Storage Tank Sites in the Tularosa-Sacramento-Salt Basins Water Planning Region
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City [a]	Release/Facility Name [b,c]	Release ID	Facility ID	Physical Address [c]	Status [d]
Otero County (cont.)					
Alamogordo (cont.)	Richardson Motors	2516	30223	318 S White Sands Blvd	Cleanup, Responsible Party
	Ritchie Distributing Co B	4608	1728	3301 N White Sands	Pre-Investigation, Confirmed Release
	Sav O Mat D	4105	30494	705 10th St	Cleanup, Responsible Party
	Sav O Mat D	4558	30494	705 10th St	Investigation, Responsible Party
	Snm-Dps/State Police	2225	27693	411 Tenth St	Investigation, State Lead, CAF
	South Town Chevron	4384	1820	806 S White Sands	Investigation, Responsible Party
	Stough Lowell/Jennings	1918	1841	1600 North White Sands Blvd	Cleanup, Responsible Party
	Tenth Street Exxon	4668	26219	1310 Tenth St	Cleanup, Responsible Party
	Uptown Chevron	3408	1976	1400 Tenth St	Investigation, Responsible Party
	US 70 West	2679	1977	1445 Hwy 70 W	Cleanup, Responsible Party
	White Snds Prod	143	31614	N Eddy Rd	Investigation, Responsible Party
	Ritchie Dist Co B	3519	1728		Investigation, Responsible Party
	Sav-O-Mat D	2692	30494	705 10th St	Cleanup, Responsible Party
	White Sands Blvd	81	31613	800 900 Blocks White Sands Blvd	Aggr Cleanup Completed, Resp 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.

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Table 5-12. Leaking Underground Storage Tank Sites in the Tularosa-Sacramento-Salt Basins Water Planning Region

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City [a]	Release/Facility Name [b,c]	Release ID	Facility ID	Physical Address [c]	Status [d]
Otero County (cont.)					
Holloman Air Force Base	BX Service Station #18	266	31363	Bldg 828 3	Cleanup, Federal Facility
	US AF Bldg 15	3598	31343	833 Csg Cc	Investigation Federal Facility
Oro Grande	Oro Grande Rnch Camp	2628	26218	Building 8659	Investigation Federal Facility
McGregor Range	Building Range Camp C	3559	47989	Bldg 9691	Investigation Federal Facility
	Ft Bliss Area 9485	2147	29324	Building 9486	Investigation Federal Facility
	McGregor Range Camp	3387	29324	Building 9486	Investigation Federal Facility
	McGregor Range Camp C	3453	29328	Building 9522	Investigation Federal Facility
	McGregor Range Camp F	3561	29331	Building 9691	Investigation Federal Facility
	McGregor Range Camp, Fort Bliss Area 9486	4479	29324	Building 9486	Investigation Federal Facility

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

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

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

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

[d] Pre-Investigation, Suspected Release: Release not confirmed by definition
Pre-Investigation, Confirmed Release: Confirmed release as by definition
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Aggressive Cleanup Completed (Aggr Cleanup Completed): Effective removal of contamination complete
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CAF: Corrective action fund

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 three operating landfills and four closed landfills (Table 5-13, Figure 5-14).

Table 5-13. Landfills in the Tularosa-Sacramento-Salt Basins Water Planning Region

County	Landfill Name [a]	Landfill Operating Status	Landfill Closure Date
Otero	City of Alamogordo	Closed	—
	Dog Canyon Landfill	Closed	—
	Holloman AFB Landfill	Closed	—
	Mesa Verda C&D	Open	NA
	Otero/Greentree County Regional Landfill	Open	NA
	Otero/Lincoln County Regional	Open	NA
	Timberon Landfill	Closed	—

Sources: Livingston and JSAI, 2002; NMED, 2014b, 2015a, 2015b
[a] Names appear as listed in the NMED database.

NA = Not applicable
— = Information not available

5.4.1.5 Nonpoint Sources

As discussed in the accepted regional water plan and in Section 5.3 of this update, naturally occurring salinity in the Tularosa and Salt Basins is the primary water quality concern.

Other nonpoint sources include poorly maintained septic tanks which are, particularly in the Alamogordo area (Livingston and JSAI, 2002), a significant source of nitrate contamination in groundwater. In areas with shallow water tables or in karst terrain, septic system discharges can percolate rapidly to the underlying aquifer and increase concentrations of (NMWQCC, 2002):

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

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

Other nonpoint sources of pollutants that are concerns for surface water quality in the planning region include wildfires, grazing, agriculture, recreation, hydromodification, streambank destabilization/modification, removal of riparian vegetation, road and highway maintenance, land disposal, resource extraction, road runoff, septic tanks, and natural and unknown sources (Table 5-8).

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). Several watershed groups are active in the Tularosa-Sacramento-Salt Basins region:

- The Three Rivers Creek and Tularosa Creek Watershed Committee has identified needed restoration projects in the Three Rivers Creek and Tularosa Creek Watershed (Three Rivers Creek and Tularosa Creek Watershed Committee, 2007).
- The Mescalero Apache Tribe Watershed Restoration Project was awarded funding in 2014 to treat 600 acres on Mescalero Apache tribal lands in collaboration with the New Mexico State Forestry Division (NMEMNRD, 2014b). The goal of this project is to reduce the risk of a catastrophic wildfire.
- Reducing catastrophic wildfire risk is also the goal of the Two Goats Watershed Restoration Project in Otero County. Funding has been secured for the project, which will be completed in partnership with the U.S. Forest Service (NMEMNRD, 2014a; Barbati, 2014).
- Additional funding from the Federal Emergency Management Agency (FEMA) has also been secured for a Bonito Lake restoration project that will be used to clear debris and sediment from the lake, which was heavily impacted by the Little Bear Fire (Bear, 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 and 2060 Administrative Water Supply

The administrative water supply (i.e., total withdrawals) in 2010 for the Tularosa-Sacramento-Salt Basins region, as reported in the *New Mexico Water Use by Categories 2010* report (Longworth et al., 2013), was 32,814 acre-feet. Of this total, 10,005 acre-feet were surface water withdrawals and 22,810 acre-feet were groundwater. The breakdown of these withdrawals among the various categories of use detailed in the *New Mexico Water Use by Categories 2010 report* is discussed in Section 6.1.

However, for regions such as the Tularosa-Sacramento-Salt Basins planning region, where the aquifers are being depleted, the administrative water supply may not be sustainable in the future. In these cases the future available supply was estimated as described in the following subsections.

5.5.1.1 Model Predicted Decline

Non-stream connected groundwater basins with available NMOSE administrative models were used to predict the water level declines in the year 2060 based on estimated groundwater diversions. These declines were compared to the available water column to assess the potential impact on future pumping as outlined in Table 5-14a. The predicted drawdown in 2060 from a model cell in a heavily stressed area was selected and compared to the available water column in existing wells to calculate the percentage of wells impacted by the drawdown. This percentage of impacted wells was assumed to reflect a percentage reduction in the available supply.

Using this method, the administrative supply in the Tularosa Basin (Keyes, 2015) within Otero County in decade 2060 was calculated to be 33 percent less than the 2010 supply, reduced from 18,742 ac-ft/yr to 12,464 ac-ft/yr in a normal (i.e., no drought) year.

Table 5-14a. Projected Groundwater Supply in Tularosa Underground Water Basin, Otero County in 2060, Based on Modeled Drawdown

Row	Calculation Step	Tularosa UWB	Explanation/Source
1	Estimated groundwater diversions in 2010 (ac-ft/yr)	18,742	Longworth et al., 2013 (Tularosa UWB in Otero County)
2	Modeled pumping in future decades (ac-ft/yr)	15,929	Keyes, 2015
3	Ratio of administrative supply to modeled pumping	1.2	Row 1 divided by Row 2
4	Median water column (feet)	138	Difference between water level at the top of the well and total depth of the well, based on 285 wells from WATERS database with post-1997 water level data
5	Available water column (feet)	96.6	NMISC Handbook (2013) guideline (70% of median water column)
6	Predicted drawdown from model into 2060 (feet)	55.0	Greatest decline in the modeled area Keyes, 2015)
7	Adjusted model-predicted drawdown in 2060 (feet)	64.7	Row 3 times Row 6
8	Percentage of wells impacted (percentage reduction in supply)	33%	Row 7 divided by Row 5 times 50%
9	Revised supply by 2060 due to continued pumping (ac-ft/yr)	12,464	Row 1 reduced by Row 8

UWB = Underground Water Basin
ac-ft/yr = Acre-feet per year

5.5.1.2 Observed Rate of Decline

Another method to predict the future decline of the saturated thickness and thus available supply is to use existing wells with water level hydrographs and compare the predicted decline with the available water column in existing wells:

- Using the average rate of water level decline calculated from USGS monitor wells within the non-stream connected groundwater and assuming that this rate will continue, the water level decline to 2060 was predicted as shown in Table 5-14b.
- The percentage of impacted wells was estimated by comparing the predicted drawdown to the available water column in existing wells, and the percentage of impacted wells was assumed to represent the reduction in supply by 2060.

The predicted water level declines in the basin-fill aquifers of the Tularosa, Hueco, and Salt UWBs are about 20 to 55 feet by 2060, assuming an average water level decline of between 0.4 and 1.1 feet per year. A predicted decline of 30 feet in the Tularosa Basin within Otero County would impact about 15 percent of the wells, about half of the impact predicted by the groundwater model. Assuming that the percentage of impacted wells results in an equal impact on water supply, then the estimated supply in 2060 is reduced proportionally in each of the UWBs shown in Table 5-14b.

5.5.1.3 Other Considerations

Both of these approaches represent an approximation of the impact on existing wells by 2060. Factors that may affect the accuracy of these predictions include:

- The water columns may not represent the available supply because some existing wells could possibly be drilled deeper.
- The shallowest wells that are most impacted may not proportionally represent the distribution of pumping (the deeper wells most likely pump more than the shallow wells).
- New wells could be drilled in other parts of the aquifer, although doing so would require a water right permit.

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, in the Tularosa-Sacramento-Salt Basins region, 2010 was a year with above average snowpack (Figure 5-5) and, according to the PDSI (Figures 5-6a and 5-6b), a near normal water year overall. As discussed in Section 5.1, the PDSI is an indicator of whether

Table 5-14b. Projected Groundwater Supply in Tularosa-Sacramento-Salt Basins Water Planning Region in 2060 Based on Observed Rate of Decline

Row	Calculation Step	Underground Water Basin (County)				Explanation/Source
		Tularosa Basin		Hueco Basin	Salt Basin	
		(Otero)	(Lincoln)	(Otero)	(Otero)	
1	Estimated groundwater diversions in 2010 (ac-ft/yr)	18,742	650	95	3,109	Longworth et al., 2013
2	Median water column (feet)	138	134	365	254	Difference between water level at the top of the well and total depth of the well, based on 285 wells in the Tularosa UWB (Otero County), 14 wells in the Tularosa UWB (Lincoln County), 16 wells in the Hueco UWB, and 10 wells in the Salt Basin UWB from WATERS database with post-1997 water level
3	Available water column	96.6	93.8	256	178	NMISC Handbook (2013) guideline (70% of median water column)
4	Rate of water level decline (ft/yr)	0.59	0.62	1.09	0.41	Using the water level data for USGS monitor wells in the non-stream-connected groundwater basin with decreasing water levels (Figure 5-11), the change in water level from the 1980s to the most recent measurement date was calculated and divided by the elapsed time. The results were averaged to determine a single rate.
5	Estimated decline in 50 years (feet)	29.5	31.0	54.5	20.5	The average rate of water level decline was multiplied by 50 years to predict the average drawdown by 2060.
6	Percentage of wells impacted	15%	17%	11%	6%	Row 5 divided by Row 3 and multiplied by 50%
7	Groundwater supply from mined sub-basins in 2060 (ac-ft/yr)	15,880	543	85	2,930	Row 1 reduced by Row 6

ac-ft/yr = Acre-feet per year
UWB = Underground Water Basin

drought conditions exist and if so, what the relative severity of those conditions is. For the four main climate divisions present in the Tularosa-Sacramento-Salt Basins region, the PDSI classifications for 2010 were near normal (Climate Divisions 5 and 6) and incipient wet spell (Divisions 7 and 8).

Given that the water use data for 2010 represent a near 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 Tularosa-Sacramento-Salt Basins region, there is only one gage with a long-term record that included 2010 data. The Tularosa Creek near Bent gage had a ratio of 0.55 for minimum annual yield (5,850 acre-feet in 1959) to 2010 yield (10,715 acre-feet) (USGS, 2014c). Based on the region's total administrative surface water supply of 10,005 acre-feet (Section 5.5.1), the drought-adjusted surface water supply is 5,503 acre-feet. With the 22,810 acre-feet of groundwater supply, the total drought supply is 28,312 acre-feet, or about 86 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. This approach does not evaluate mitigating influences of reservoir storage in early phases of a drought when storage is available or potential development of new groundwater supplies. Nonetheless, the adjusted drought supply provides a rough estimate of what may be available during a severe to extreme drought year.

In addition to the variability in surface water supply from year to year, in non-stream-connected basins, the change in recharge during a drought is also important, possibly even more so. To estimate the vulnerability of the closed basins within a planning region to a prolonged drought, groundwater models are used, where available, to predict the potential impact by 2060 of a 20-year drought.

The method adopted by the State for estimating drought supplies in non-stream connected aquifers is as follows:

- The drought adjustment is applied only to the portion of the administrative water supply that derives water from the mined aquifer.
- In basins for which NMOSE has an administrative model, the simulation period is from 2010 to 2060 as described above, with no recharge from 2020 to 2040.
- For a conservative approximation, the drawdown predicted during the drought period is derived from a model cell in a heavily stressed area at the end of the simulation period (2060) to represent the water column that will be lost due to drought and pumping (Table 5-15).
- The percentage impact on the water supply for the modeled area is applied to those areas where no model is available.
- This adjusted predicted drawdown is then compared to the median available water column in 2010 (as described in Section 5.5.1.1) to determine the percentage of wells that are impacted by the 20-year drought and continued pumping.
- This percentage represents the reduction in supply due to drought. The drought supply will be estimated by multiplying the percentage by the 2060 administrative supply.

The estimated 2060 administrative supply in the closed basins due to continued pumping and one 20-year drought with no recharge over the 50-year planning period, is about 56 percent of the 2010 groundwater supply, for a total of 12,581 ac-ft/yr in 2060 plus 213 acre-feet of groundwater pumped in all other areas of the water planning region. Combined with the drought-adjusted administrative surface water supplies of 5,489 ac-ft/yr within the closed basins and 14 ac-ft/yr in all other areas of the water planning region, the 2060 total drought-adjusted administrative water supply is estimated to be 56 percent less than the 2010 administrative water supply, or 18,297 ac-ft/yr.

Table 5-15. Projected Drought Water Supply in Tularosa-Sacramento-Salt Basins Water Planning Region in 2060

Row	Calculation Step	Underground Water Basin (County)				Explanation/Source
		Tularosa Basin		Hueco Basin	Salt Basin	
		(Otero)	(Lincoln)	(Otero)	(Otero)	
1	Estimated groundwater diversions in 2010 (ac-ft/yr)	18,742	650	95	3,109	Longworth et al., 2013
2	Modeled pumping (ac-ft/yr)	15,929	NA	NA	NA	Keyes, 2015
3	Ratio of administrative supply to modeled pumping	1.2	NA	NA	NA	Row 1 divided by Row 2
4	Available water column (feet)	96.6	93.8	256	178	Row 3 of Table 5-14b
5	Predicted additional drawdown from 20-year drought (feet)	25.0	NA	NA	NA	Keyes, 2015
6	Adjusted predicted drawdown in 2060 due to drought (feet)	29.4	NA	NA	NA	Row 5 times Row 3
7	Total drawdown due to pumping and drought	94.1	NA	NA	NA	Row 7 of Table 5-14a plus Row 6
8	Reduction in supply due to drought and pumping	49%	17% + 15% = 32%	11% + 15% = 26%	6% + 15% = 21%	Row 7 divided by Row 4 times 50% for Tularosa Basin in Otero County. For the other non-modeled basins, the estimated increase (15%) from modeled drought was added to the predicted water level decline rate (Row 6 of Table 5-14b).
9	Revised groundwater supply by 2060 with 20-year drought (ac-ft/yr)	9,611	444	70	2,456	Row 1 reduced by the Row 8 total percentage

ac-ft/yr = Acre-feet per year
NA = Information not available

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 Figures 6-1a through 6-1d.

The predominant water use in 2010 in the Tularosa-Sacramento-Salt Basins region was for irrigated agriculture, and the largest water use in Otero County has traditionally been irrigated agriculture. For the portion of Lincoln County in the planning region, public water supply is the predominant use.

Groundwater was the source of the majority of water withdrawals (70 percent) in the Tularosa-Sacramento-Salt Basins planning region in 2010. Most of the groundwater use in the region is for irrigated agriculture. Groundwater points of diversion (i.e., well locations) 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 demand 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.

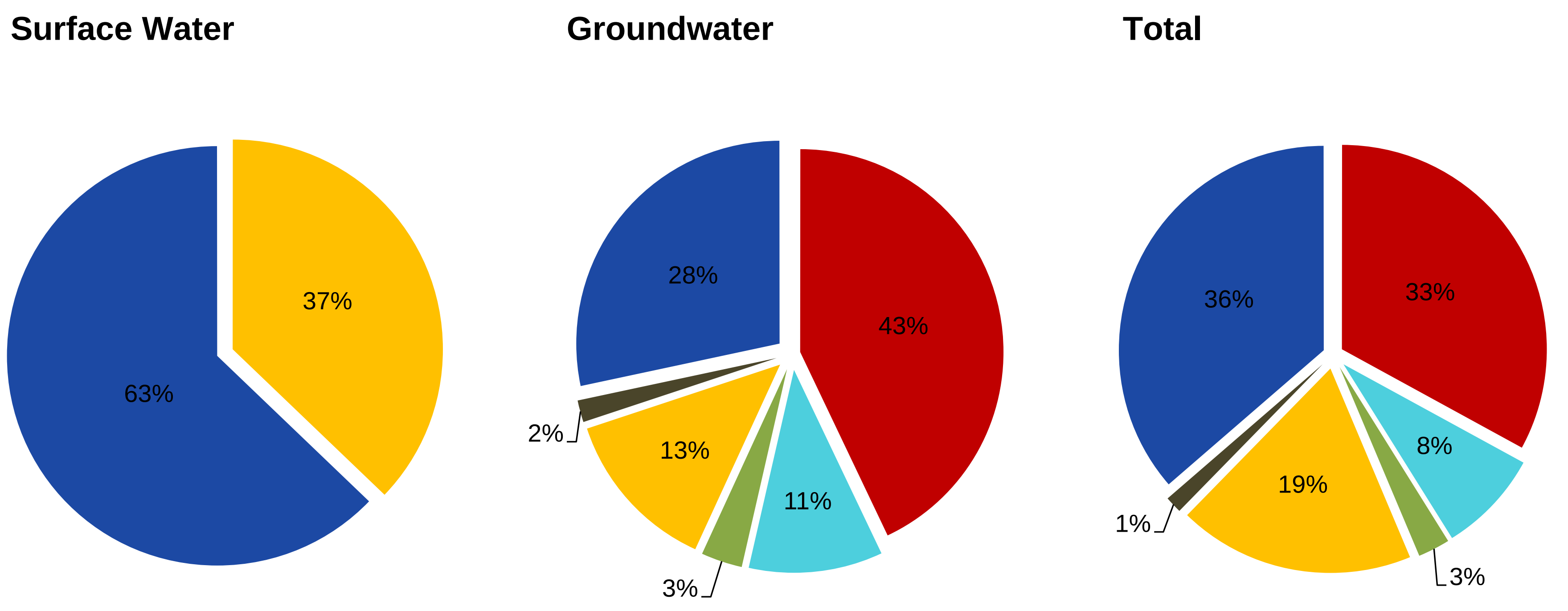
- *Instream flow:* The analysis of the gap between supply and demand relies on the largest use categories that reflect withdrawals for human use or reservoir storage that allows for withdrawals downstream upon release of the stored water. It is recognized that there is also value in preserving instream 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.

Table 6-1. Total Withdrawals in the Tularosa-Sacramento-Salt Basins Water Planning Region in 2010

Water Use Category	Withdrawals (acre-feet) [a]														
	Lincoln County			Otero County			Chaves County			Eddy County			Planning Region		
	Surface Water	Ground-water	Total	Surface Water	Ground-water	Total	Surface Water	Ground-water	Total	Surface Water	Ground-water	Total	Surface Water	Ground-water	Total
Commercial (self-supplied)	0	298	298	189	1,623	1,813	0	0	0	0	0	0	189	1,921	2,111
Domestic (self-supplied)	0	74	74	0	454	454	0	0	0	0	0	0	0	527	527
Industrial (self-supplied)	0	0	0	0	33	33	0	0	0	0	0	0	0	33	33
Irrigated agriculture	0	23	23	4,761	15,928	20,689	0	0	0	0	0	0	4,761	15,951	20,712
Livestock (self-supplied)	78	91	169	86	92	178	0	0	0	0	0	0	164	183	346
Mining (self-supplied)	0	12	12	0	273	273	0	0	0	0	0	0	0	285	285
Power (self-supplied)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Public water supply	132	197	329	4,759	3,712	8,471	0	0	0	0	0	0	4,891	3,909	8,800
Reservoir evaporation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	210	694	904	9,795	22,115	31,910	0	0	0	0	0	0	10,005	22,810	32,814

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.



Total usage: 210 acre-feet

Total usage: 694 acre-feet

Total usage: 904 acre-feet

Explanation

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

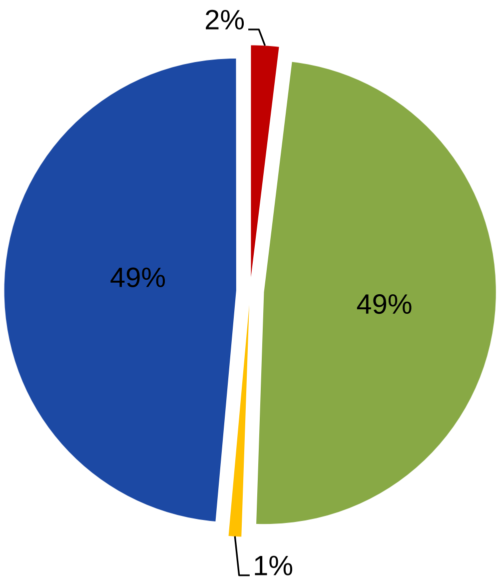
Source: Longworth et al., 2013

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.

TULAROSA-SACRAMENTO-SALT BASINS
REGIONAL WATER PLAN 2016

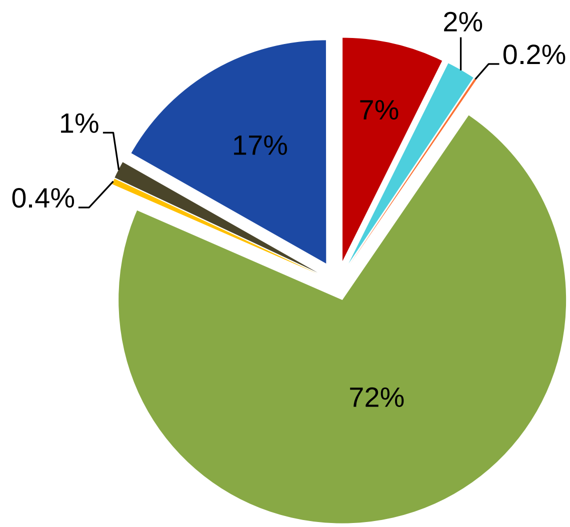
Lincoln County Water Demand, 2010

Surface Water



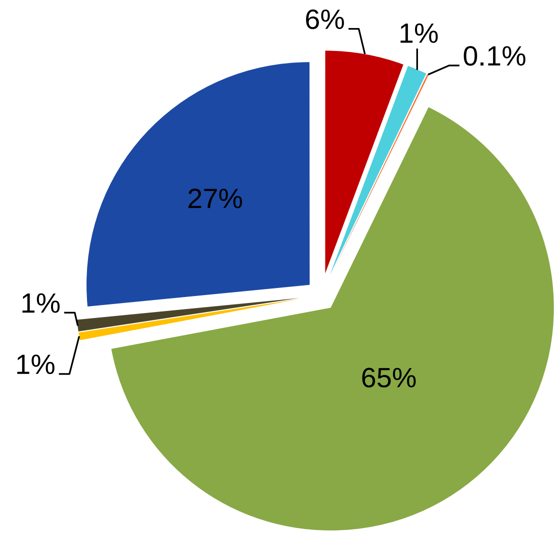
Total usage: 9,795 acre-feet

Groundwater



Total usage: 22,115 acre-feet

Total



Total usage: 31,910 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

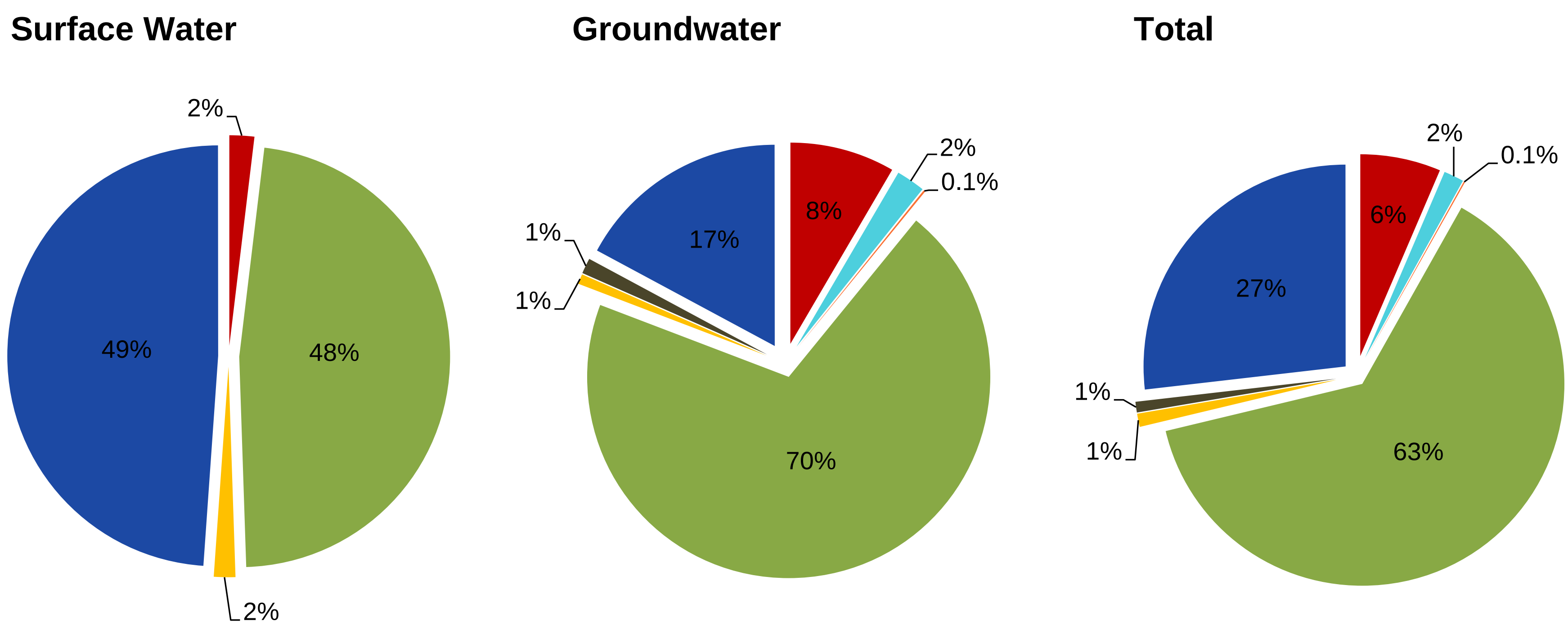
Source: Longworth et al., 2013

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.

TULAROSA-SACRAMENTO-SALT BASINS
REGIONAL WATER PLAN 2016

Otero County Water Demand, 2010

Figure 6-1b



Total usage: 10,005 acre-feet

Total usage: 22,810 acre-feet

Total usage: 32,814 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:

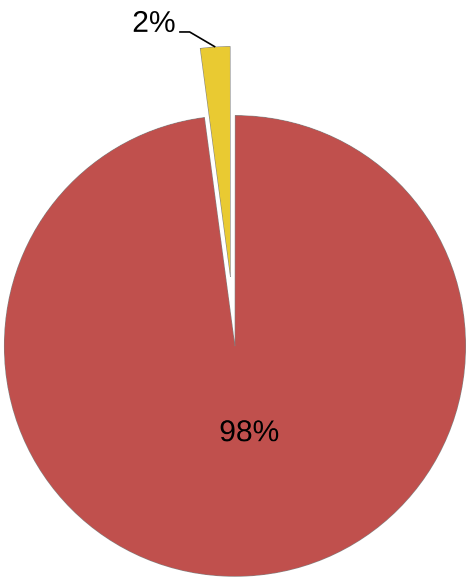
1. Only categories with usage above 0.1% are shown.
2. Tribes and pueblos in New Mexico are not required to provide water use data to the State. Therefore, tribal water use data are not necessarily reflected in this figure.

TULAROSA-SACRAMENTO-SALT BASINS
REGIONAL WATER PLAN 2016

Total Regional Water Demand by Sector, 2010

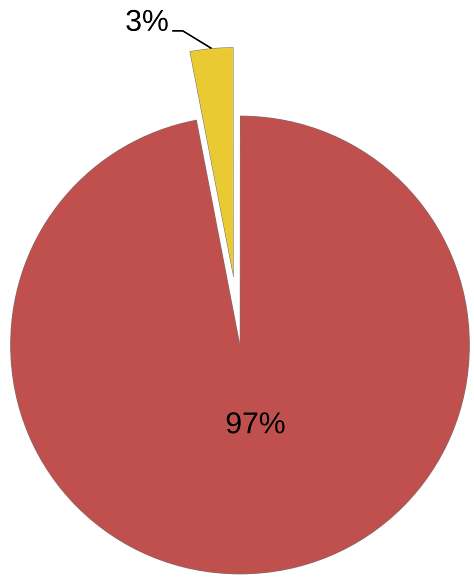
Figure 6-1c

Surface Water



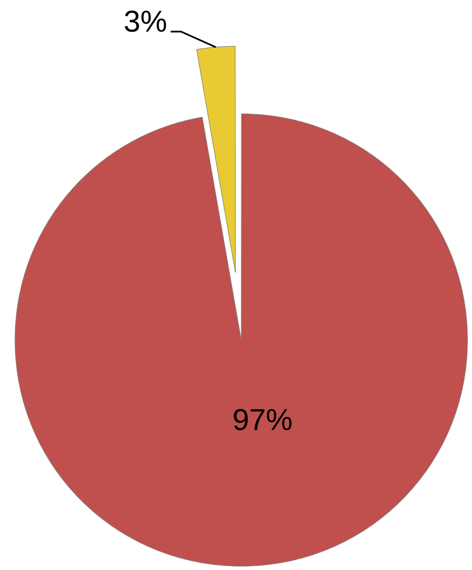
Total usage: 10,005 acre-feet

Groundwater



Total usage: 22,810 acre-feet

Total



Total usage: 32,814 acre-feet

Explanation

- Otero
- Lincoln

Source: Longworth et al., 2013

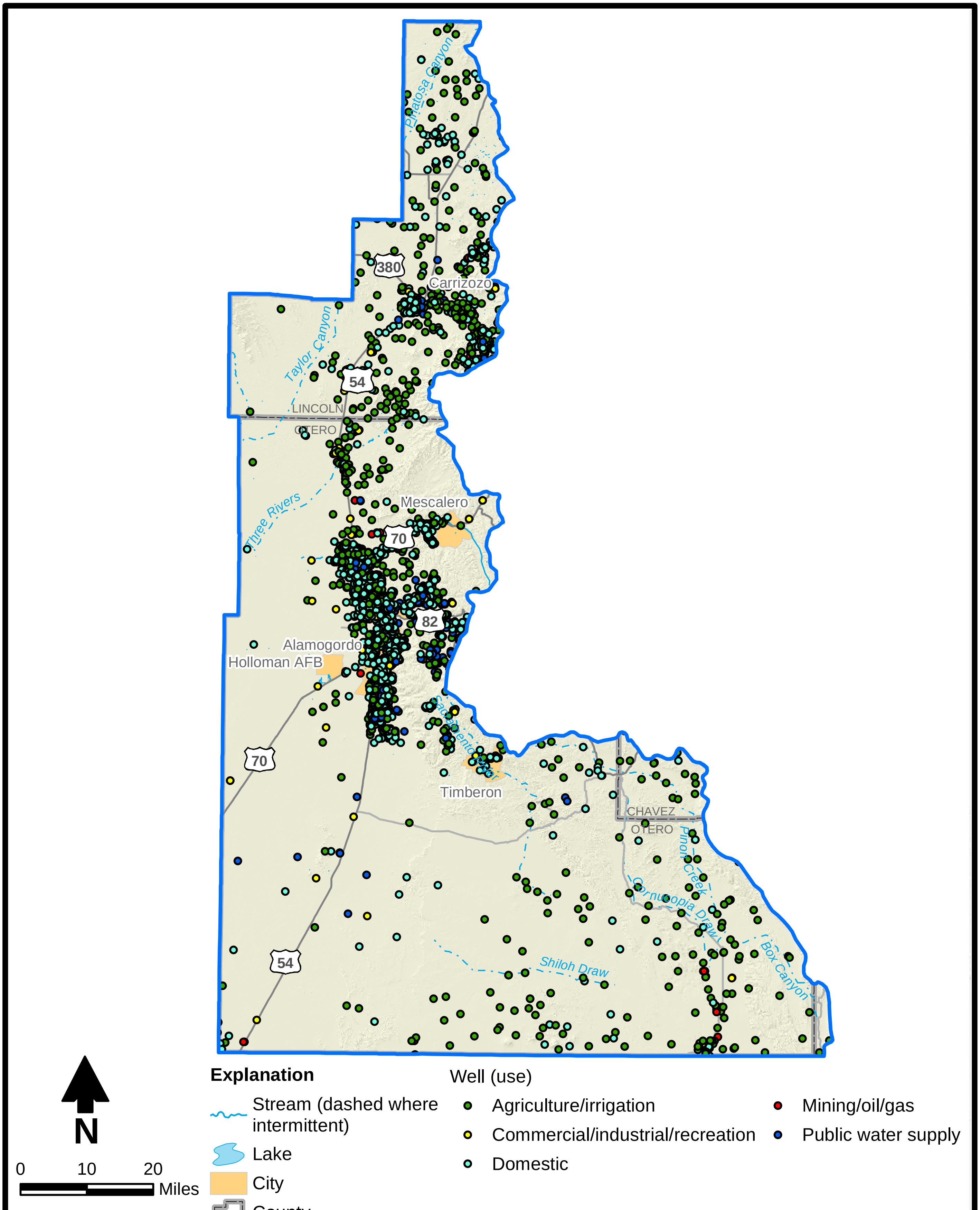
Notes:

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.

TULAROSA-SACRAMENTO-SALT BASINS
REGIONAL WATER PLAN 2016

Total Regional Water Demand by County, 2010

Figure 6-1d



TULAROSA-SACRAMENTO-SALT BASINS
REGIONAL WATER PLAN 2016
Groundwater Points of Diversion

Figure 6-2

In addition to the special conditions listed above, the 2010 NMOSE 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. A land use map was included in the 2002 water plan, and there have not been substantial changes in land use. Population and economic trends are detailed below.

The total 2013 population of Otero County (in both the Tularosa-Sacramento-Salt Basins and Lower Pecos Valley regions) was 65,616 (U.S. Census Bureau, 2014a). As shown in Table 3-1, between 2010 and 2013 the population of Otero County increased by 2.9 percent. In 2010, 95 percent of the Otero County population lived in the planning region.

The portion of Lincoln County within the Tularosa Salt Basins Water Planning Region had a population of 1,556 in 2010, as determined from U.S. Census Bureau data (2014b). There are 31 residents in the portion of Chaves County within the region and 13 persons within the portion of Eddy County within the region. No reliable figures for the portions of the populations of Lincoln and Otero counties that live in the Tularosa-Sacramento-Salt Basins region are available for 2013.

Specific information regarding the population and economic trends in Lincoln and Otero counties 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 Lincoln County

The population of the southwestern area of Lincoln County that is within the Tularosa-Sacramento-Salt Basins Water Planning Region was 1,556 in 2010, about 8 percent of the total County population (U.S. Census Bureau, 2014c). The area includes the county seat, the Town of Carrizozo, which had a 2013 population of 973, down from 996 in 2010 (U.S. Census Bureau, 2014a). The town, which was established by a railroad company in 1899, is situated at the crossroads of Highways 54 and 380. After the railroad lost its importance as the only means of transportation, Carrizozo started losing population. Today it is home to a few art galleries and attracts some tourists who are driving through town to get to the Trinity Site or other area attractions.

This part of Lincoln County includes some ranches that raise livestock. The area is quite scenic and land prices are low. A new subdivision is marketing ready-to-build land in Carrizozo and its outskirts.

6.2.2 Otero County

The total population of Otero County (within both Tularosa Salt Basins and Lower Pecos Valley Planning Regions) rose from 62,298 in 2000 to 63,797 in 2010, and to 65,616 in 2013 (U.S. Census Bureau, 2014a). The increase can be attributed to the presence of Holloman AFB and the U.S. Army's White Sands Missile Range. The 314th Fighter Squadron was recently activated, bringing hundreds of new airmen to Holloman Air Base (Kenney, 2015). It also periodically hosts military personnel from foreign countries who undergo training at Holloman.

The County is large geographically but has a small tax base, and gross receipts have decreased over the past few years. The county's economy is highly dependent on the two military bases. Tourism is not a major attraction; most of the few tourists that do visit stay in the City of Alamogordo. The lack of other industry in the area has contributed to young people leaving, and high school enrollment has dropped. The few jobs that are available are for minimum wage, service-oriented work.

The real estate market was reportedly better in 2014 than in 2013, but the residential market has been driven over the past three years mainly by retirees moving in, even though Otero County is not a big retirement community. The residential market is very dependent on Holloman AFB. The commercial market is quite soft because banks require a 25 percent down payment, which not many local businesses can afford.

Alamogordo is the largest city in the Tularosa-Sacramento-Salt Basins planning region. Between 2010 and 2013, its population increased by 3.2 percent, from 30,403 to 31,368. The City's economy is very dependent on the nearby military bases: Holloman AFB, White Sands Missile Range. In addition, Fort Bliss is just over the border in Texas. It is estimated that these three facilities generate 65 percent of Alamogordo's economy. Holloman AFB currently hosts 3,860 military personnel and 764 civilians. Gross receipts in the City have been flat over the past few years; military retirees and active duty personnel shop at the Holloman AFB Post Exchange (PX), putting local merchants at a disadvantage.

A water conservation ordinance is in effect because of the negative effects of the Little Bear Fire of 2012, which filled Alamogordo's primary surface water source, Bonito Lake, with silt. Lake Bonito needs to be dredged, a process that could take many years. Meanwhile, the City is pumping groundwater to replace the lake supply. In addition to the reduced water storage capacity and poor water quality, Bonito Lake is closed to fishing and camping, which affects tourist revenue. It is difficult to diversify the local economy because of the water situation.

The City is seeking to build a desalinization plant and is hoping to get an additional $4 million from the State for the project. In addition, water infrastructure is aging in Otero County, and the County has applied for federal funds to upgrade it.

The largest employment categories in Otero County are education and healthcare followed by government (U.S. Census Bureau, 2014b). Basic industries in Otero County (those that bring outside dollars into the local economy) are the military, federal and state government, and agriculture (Arrowhead Center, 2013). As noted in Table 3-1d, the fruits, tree nuts, berries category is the most valuable agricultural commodity in Otero County.

A new garnet mine may become operational in the next few years. Located in Orogrande, 37 miles south of Alamogordo, the proposed mine is owned by Burrell Western Resources and could produce 100,000 tons of garnets a year (Scott, 2013). According to a March 2015 newspaper article the project is estimated to cost $20 million and could generate 47 jobs. No water usage figures are available at this time and no amounts are included in the water demand projections (Section 6.5) for this mine.

In 2012 there were 486 farms and ranches in Otero County, a slight decrease from 493 in 2007. The number of acres in farms increased by 9 percent, from 1,126,432 acres to 1,223,746 acres, but irrigated lands decreased by 15 percent, from 7,045 acres in 2007 to 5,966 acres in 2012. Total government payments to farmers in the county who participated in agricultural support programs increased 191 percent between 2007 and 2012, from $406,000 to $1,183,000. The average age of a producer in the county increased from 60 years in 2007 to 62.2 years in 2012, and only 31 producers were under 45 years of age. Fruits, tree nuts, and berries are the main crops (USDA NASS, 2014).

6.3 Projected Population Growth

The population projections for the 2002 Tularosa-Sacramento-Salt Basins regional water plan covered the period from 2000 through 2040 and were based on county-level population forecasts through 2040 that were prepared by the Bureau of Business and Economic Research (BBER) at the University of New Mexico (UNM) using data and historical trends from 1960 through to the 2000 Census. The 2010 projection for the portion of Otero County in the Tularosa Salt Basins in the 2002 regional water plan consisted of a single projection for a population of 61,000 (Table 6-2), which was quite close to the figure of 60,425 estimated for this RWP update based on actual U.S. Census numbers (2014c).

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

County	2002 Regional Water Plan Projected Population [a]	Actual Population 2010 U.S. Census [b]
Lincoln	NA	1,556
Otero	61,000	60,425
Total Region	NA	61,981

[a] Livingston and JSAI, 2002
[b] U.S. Census Bureau, 2014a

NA = Not available (no projection for Lincoln County provided in 2002 Plan)

For the population projections through 2060 (Table 6-3), two population forecasts were developed: one based on a more optimistic projection of the economy and one on the premise that the economy will not recover fully from the recession. The population projections for Lincoln and Otero counties are detailed in Table 6-3 and summarized below:

- *Lincoln County:* The high scenario for the portion of Lincoln County that lies within the planning region anticipates a minimal decline in population through 2020 and then a modest upturn in the following decades. The growth is predicated on the residential real estate market turning around and more retirees moving to the area. The low scenario does not anticipate a turnaround and shows a decline in population through 2060.

- *Otero County:* The population of Otero County that lies within the planning region is projected to grow in the high scenario through 2040 and then show a small decline. The high population projections from 2010 through 2040 are similar to the BBER 2012 projections (Appendix 6-B), but whereas the 2012 BBER projection anticipated a population decline starting in 2040, the high scenario developed as part of this planning effort anticipates the continuing operation of the military bases though 2060 but with fewer personnel after 2040. The low growth scenario anticipates very modest growth through 2030 and then a decline through 2060 due to the possible closing of one or more military bases.

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 our 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

Table 6–3. Tularosa-Sacramento-Salt Basins 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
Lincoln	High	–0.23	0.51	0.49	0.35	0.17
	Low	–0.98	–1.04	–0.90	–0.71	–0.87
Otero	High	0.44	0.15	0.06	–0.05	–0.16
	Low	0.11	0.04	–0.18	–0.15	–0.19

b. Projected Population

County	Projection	Population					
		2010	2020	2030	2040	2050	2060
Lincoln	High	1,556	1,520	1,600	1,680	1,740	1,770
	Low	1,556	1,410	1,270	1,160	1,080	990
Otero	High	60,425	63,125	64,100	64,500	64,200	63,175
	Low	60,425	61,100	61,350	60,280	59,375	58,250

Source: Poster Enterprises, 2014

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 Tularosa-Sacramento-Salt Basins 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.

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

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

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

Page 1 of 3

OSE Declared Groundwater Basin(s) [a]	Water Supplier [b]	Population	Per Capita Use (gpcd)	Withdrawals (acre-feet)	
				Surface Water	Groundwater
Lincoln County					
Hondo	Cedar Creek Cabin Owners Association	242	51	0	14
	Enchanted Forest Water Co	279	48	0	15
	Fort Stanton Facility	93	80	0	8
	Loma Grande Estates Water Association	74	87	0	7
Tularosa	Carrizozo Water System (Rio Grande)	926	269	132	147
Tularosa Hondo	Nogal MDWCA	51	90	0	5
	Lincoln County public water supply totals	1,666		132	197
	County-wide public water supply per capita use [c]		176		
Tularosa Roswell	Rural self-supplied homes (Rio Grande)	824	80	0	74
	Lincoln County domestic self-supplied totals	824		0	74
	County-wide domestic self-supplied per capita use [c]		80		
Otero County					
Penasco	Chippeway Water Users Association	30	100	0	3
	Cloudcroft Water System	1,475	99	0	164
	Waterfall Community Water Users Assn (Rio Grande)	100	219	24	0
Salt Basin	National Solar Observatory	100	197	0	22
	Timberon Water & Sanitation District (Rio Grande)	300	665	133	91

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

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

[b] For systems supplied by surface water withdrawals, the river basin is provided in parentheses. Rural self-supplied homes are located in the river basin specified in parentheses.

[c] County-wide per capita use, calculated as the total population of the portion of the county within the planning region divided by total withdrawals within that portion.

gpcd = Gallons per capita per day

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

Page 2 of 3

OSE Declared Groundwater Basin(s) [a]	Water Supplier [b]	Population	Per Capita Use (gpcd)	Withdrawals (acre-feet)	
				Surface Water	Groundwater
Otero County (cont.)					
Tularosa	Alamo Heights WUA	60	103	0	7
	Boles Acres Water System	975	143	0	156
	Canyon Hills WUA	50	180	0	10
	Cider Mill Farms WUA	50	120	0	7
	Dog Canyon MDWCA	28	100	0	3
	Dungan MDWCA	90	130	0	13
	Eileen Acres	225	195	0	49
	Enchanted Valley Water Users	42	293	0	14
	Freeman's / Crossroads Mobile Home Park	60	261	0	18
	High Rolls Community Water Users Coop	300	94	0	32
	Holloman Air Force Base (Rio Grande)	8,600	167	504	1,103
	Karr Canyon Estates	75	104	0	9
	La Luz MDWCA (Rio Grande)	2,500	48	64	71
	Laborcita Water Users Association	60	1,422	0	96
	Low Mesa WUA	25	141	0	4
	Mountain Orchard WUA	40	284	0	13
	Piney Woods WUA	250	102	0	29
	Rolling Hills WUA	30	147	0	5
	Tularosa Water System	2,800	214	0	671
Tularosa Hondo	Alamogordo Domestic Water System (Rio Grande)	37,290	110	4,033	1,031

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

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

[b] For systems supplied by surface water withdrawals, the river basin is provided in parentheses. Rural self-supplied homes are located in the river basin specified in parentheses.

gpcd = Gallons per capita per day

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

Page 3 of 3

OSE Declared Groundwater Basin(s) [a]	Water Supplier [b]	Population	Per Capita Use (gpcd)	Withdrawals (acre-feet)	
				Surface Water	Groundwater
Otero County (cont.)					
Tularosa Salt Basin	Orogrande MDWCA	67	375	0	28
NA	Evergreen Mobile Home Park	160	100	0	18
	Oasis Mobile Home Park	182	36	0	7
	Wright Wimberly Joint Venture	345	100	0	39
	Otero County public water supply totals	56,309		4,759	3,712
	County-wide public water supply per capita use [c]		134		
Hueco Salt Tularosa	Rural self-supplied homes (Rio Grande)	4,050	100	0	454
	Otero County domestic self-supplied totals	4,050		0	454
	County-wide domestic self-supplied per capita use [c]		100		

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

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

[b] For systems supplied by surface water withdrawals, the river basin is provided in parentheses. Rural self-supplied homes are located in the river basin specified in parentheses.

[c] County-wide per capita use, calculated as the total population of the portion of the county within the planning region divided by total withdrawals within that portion.

gpcd = Gallons per capita per day
NA = Not applicable

For the Tularosa-Sacramento-Salt Basins region, current per capita use in Lincoln County is under 130 gpcd (Table 6-4), so no additional conservation is assumed. Otero 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 all 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 Tularosa-Sacramento-Salt Basins 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 zero to 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, but no reservoirs with a 5,000-acre-foot or larger storage capacity are present in the Tularosa-Sacramento-Salt Basins region. Because no significant reservoir evaporation occurs in the region, 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 Tularosa-Sacramento-Salt Basins region. The projections of future water demand determined using this consistent method, as applicable, for the Tularosa-Sacramento-Salt Basins 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 Tularosa-Sacramento-Salt Basins region are discussed in Section 6.5.2.

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

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

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

The *domestic (self-supplied)* category includes self-supplied residences with well permits issued by the NMOSE under 72-12-1.1 NMSA 1978 (Longworth et al., 2013). Such residences may be single-family or multi-family dwellings. High and low projections were calculated as the 2010 domestic withdrawal amount plus a value determined by multiplying the projected change in population (high and low) times the domestic self-supplied per capita use from the *New Mexico Water Use by Categories 2010* report (Longworth et al., 2013) times the calculated proportion of the population that was self-supplied in 2010 (calculated from Longworth et al., 2013). In counties where the high and/or low projected growth rate is negative, the projection was set equal to the 2010 domestic withdrawal amount. This allows for continuing use of existing domestic wells, which is anticipated, even when there are population declines in a county. In regions where the population growth is initially positive but later shows a decline, the water demand projection was kept at the higher level for the remainder of the planning period, based on the assumption that domestic wells will continue to be used even if there are later population declines.

The *irrigated agriculture* category includes all withdrawals of water for the irrigation of crops grown on farms, ranches, and wildlife refuges (Longworth et al., 2013). To understand trends in the agricultural sector, interviews were held with farmers, farm agency employees, and others with extensive knowledge of agriculture practices and trends in each county. Additionally, the New Mexico agriculture census data for 2007 and 2012 were reviewed and provided helpful agricultural data such as principal crops, irrigated acreage, farm size, farm subsidies, and age of farmers (USDA NASS, 2014). Comparison of the two data sets shows a downward trend in the agricultural sector across New Mexico. 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 Tularosa-Sacramento-Salt Basins Projected Water Demand

Table 6-5 summarizes the projected water demands for each water use category for each of the three counties, which were developed by applying the methods discussed in Section 6.5.1. As discussed in Section 6.3, under the low scenario, population is projected to decline in Lincoln County and to grow very modestly through 2030 in Otero County and then decline through 2060. For the high growth scenario, population is projected to decline slightly in Lincoln County through 2020 and then upturn slightly in the subsequent decades. In Otero County, population is anticipated to grow through 2040 and then show a small decline in the subsequent decades.

Demand in the *public water supply, domestic, and commercial* categories is projected to increase in Otero and Lincoln counties under the high scenario, proportional to the increasing population projections. However, use in these categories is not projected to decline proportionally to the projections indicating declining population, because as discussed in Section 6.5.1, the water suppliers retain their valuable water rights and, for planning purposes, it is assumed for the low projection that use in these three categories will remain at 2010 levels for Lincoln County and at the maximum level achieved before population declines in Otero County.

The current observed declining trend in *agricultural* water use is expected to continue for the short-term; for the low projection, this is assumed to be through 2020, with agriculture beginning to recover by 2030.

For the high scenario, the amount of water devoted to irrigated agriculture in Otero County is projected to remain at the 2010 level since water rights have economic value and will continue to be used. The low scenario anticipates a drop in groundwater use to 80 percent of the 2010 level in 2020, with a rebound to 85 percent of the 2010 level in the next two decades. By 2050, groundwater usage is projected to be at 90 percent of 2010 levels and remain there through 2060. No decline is expected in surface water use; thus, the overall projected decline under the low scenario is less than the percentage decline in groundwater use.

Table 6-5. Projected Water Demand, 2020 through 2060 Tularosa-Sacramento-Salt Basins Water Planning Region

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Use Sector	Projection	Water Demand (acre-feet) [a]					
		2010 [b]	2020	2030	2040	2050	2060
Lincoln County							
Public water supply	High	329	329	332	337	340	341
	Low	329	329	329	329	329	329
Domestic (self-supplied)	High	74	74	75	78	79	80
	Low	74	74	74	74	74	74
Irrigated agriculture	Low/High	23	23	23	23	23	23
Livestock (self-supplied)	High	169	169	169	169	169	169
	Low	169	93	101	118	135	144
Commercial (self-supplied)	High	298	298	314	329	341	347
	Low	298	298	298	298	298	298
Industrial (self-supplied)	Low/High	0	0	0	0	0	0
Mining (self-supplied)	Low/High	12	12	12	12	12	12
Power (self-supplied)	Low/High	0	0	0	0	0	0
Reservoir evaporation	Low/High	0	0	0	0	0	0
Otero County							
Public water supply	High	8,471	8,635	8,693	8,715	8,715 [c]	8,715 [c]
	Low	8,471	8,512	8,527	8,527 [d]	8,527 [d]	8,527 [d]
Domestic (self-supplied)	High	454	474	481	484	484 [c]	484 [c]
	Low	454	459	461	461 [d]	461 [d]	461 [d]
Irrigated agriculture	High	20,689	20,689	20,689	20,689	20,689	20,689
	Low	20,689	17,503	18,300	18,300	19,096	19,096
Livestock (self-supplied)	High	178	107	125	134	151	160
	Low	178	98	116	125	134	142
Commercial (self-supplied)	High	1,813	1,894	1,923	1,935	1,935 [c]	1,935 [c]
	Low	1,813	1,833	1,840	1,840 [d]	1,840 [d]	1,840 [d]
Industrial (self-supplied)	Low/High	33	33	33	33	33	33
Mining (self-supplied)	Low/High	273	273	273	273	273	273
Power (self-supplied)	Low/High	0	0	0	0	0	0
Reservoir evaporation	Low/High	0	0	0	0	0	0

[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] Projections set equal to 2040 decade high
[d] Projections set equal to 2030 decade high

Table 6-5. Projected Water Demand, 2020 through 2060 Tularosa-Sacramento-Salt Basins Water Planning Region

Use Sector	Projection	Water Demand (acre-feet) [a]					
		2010 [b]	2020	2030	2040	2050	2060
Total region							
Public water supply	High	8,800	8,964	9,025	9,052	9,055	9,056
	Low	8,800	8,841	8,855	8,855	8,855	8,855
Domestic (self-supplied)	High	527	548	556	562	564	564
	Low	527	533	534	534	534	534
Irrigated agriculture	High	20,712	20,712	20,712	20,712	20,712	20,712
	Low	20,712	17,526	18,323	18,323	19,119	19,119
Livestock (self-supplied)	High	346	276	294	303	320	329
	Low	346	191	217	243	269	286
Commercial (self-supplied)	High	2,111	2,192	2,237	2,264	2,276	2,282
	Low	2,111	2,131	2,139	2,139	2,139	2,139
Industrial (self-supplied)	Low/High	33	33	33	33	33	33
Mining (self-supplied)	Low/High	285	285	285	285	285	285
Power (self-supplied)	Low/High	0	0	0	0	0	0
Reservoir evaporation	Low/High	0	0	0	0	0	0
Total regional demand	High	32,814	33,010	33,142	33,211	33,245	33,262
	Low	32,814	29,539	30,386	30,412	31,234	31,251

[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] Projections set equal to 2040 decade high

[d] Projections set equal to 2030 decade high

In Lincoln County the amount of water used for irrigated agriculture is minimal, and use in this category is projected to remain at 2010 levels throughout the forecast period.

The *livestock* category in Otero County under the high scenario is expected to be at 60 percent of 2010 levels in 2020 and to gradually recover to 90 percent of 2010 levels in 2060. In the low scenario, water usage will recover only to 80 percent of 2010 use by 2060, assuming that the drought continues and ranchers continue to abandon this occupation.

In Lincoln County, water usage for livestock is expected to drop to 65 percent of the 2010 level in the high scenario and to 55 percent in the low scenario, reflecting current trends in livestock production. By 2060 this category is projected to reach 90 percent and 85 percent of 2010 water usage in the high and low projections, respectively.

Mining use in Lincoln County is very minimal. However, several aggregate mining operations and one gold and silver mine currently are operating in Otero County. For the projections through 2060, water usage in this category is assumed to remain steady under both the high and low scenarios. The projections in Table 6-5 do not take into account the possible opening of a garnet mine in Orogrande. The processing of the garnets may take place in another water planning region, a fact that could minimize water use in Otero County.

Power and *industrial* activity in the region is very low. No power water usage occurs in the region, and only a minimal amount of water is used for industrial purposes. This usage, in Otero County, is expected to remain stable through 2060 under both the high and low scenarios.

No significant water use in the *reservoir evaporation* category occurs in the Tularosa-Sacramento-Salt Basins region; therefore, no water usage was projected for this category. However, in an effort to conserve water, the City of Alamogordo has recently covered some of its raw-water storage reservoirs to inhibit evaporation (Heberle, 2015). The covers consist of high-density polyethylene (HDPE) in the center and polypropylene, which is more flexible, on the outer edges. The design allows the cover to rest on the water surface, rising and falling as the reservoir stage fluctuates. It is estimated that the cover has reduced evaporation by 90 percent or more and that water saved using the cover would probably equal the water produced from a new well. The cost of the covers was about $44,000 per acre, leading to a cost of about $645 per acre-foot of water salvaged if the covers last for 15 years.

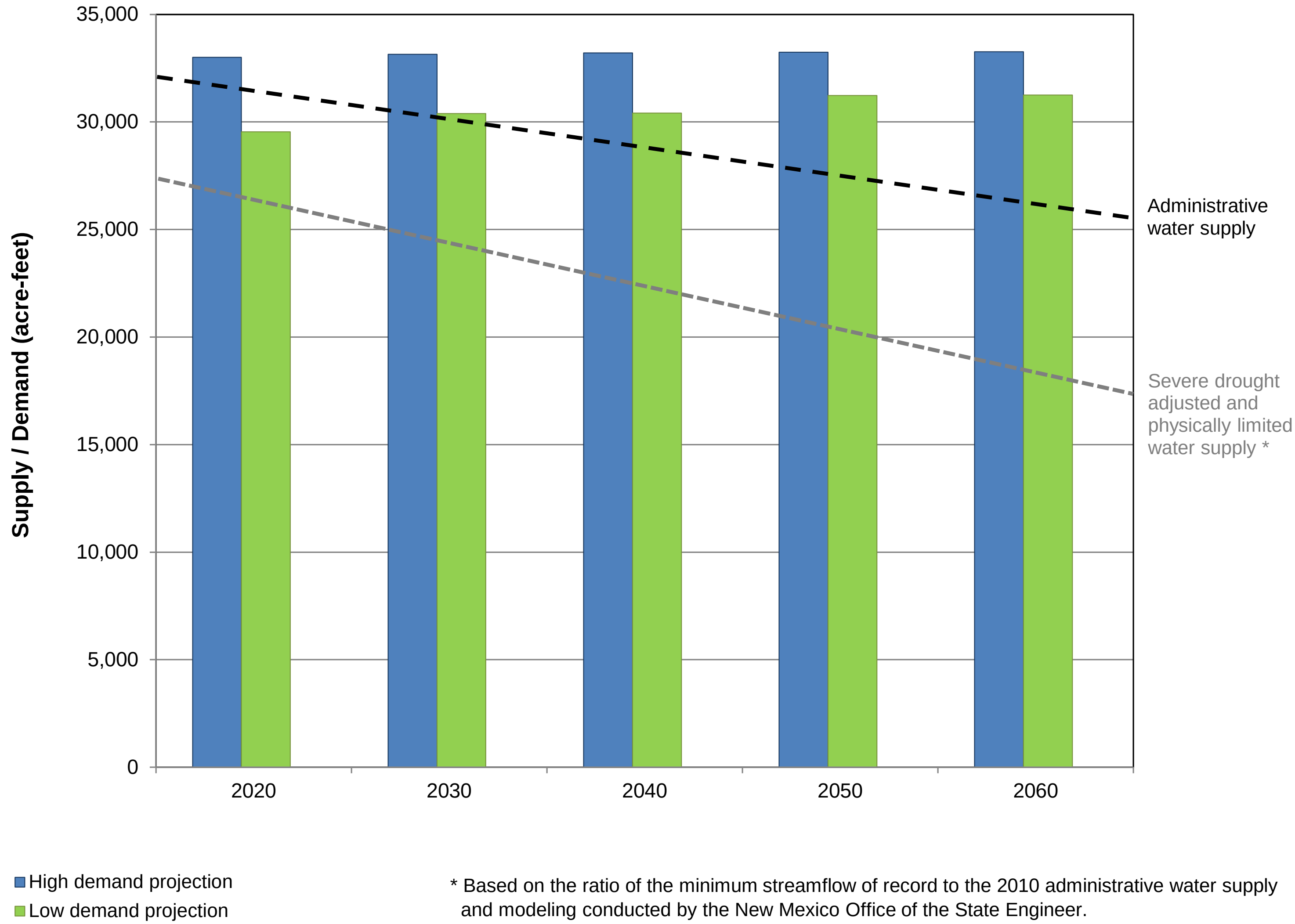
7. Identified Gaps between Supply and Demand

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

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

- In wet years when more water is available than in 2010, irrigators can increase surface water diversions up to their water right and reservoirs will fill when inflow exceeds downstream demand, provided that compact requirements are satisfied, to increase storage for subsequent years. Thus, though not quantified, the withdrawals in wet years may be greater than the high projection.
- Supplies in one part of the region may not necessarily be available to meet demands in other areas, particularly in the absence of expensive infrastructure projects. Therefore comparing the supplies to the demands for the entire region without considering local issues provides only a general picture of the balance.
- As discussed in Section 4, there are considerable legal limitations on the development of new surface and groundwater resources, given that surface and surface-connected groundwater supplies are fully appropriated, which affects the ability of the region to prepare for shortages by developing new supplies. Additionally, large areas in the eastern portion of the Tularosa Basin are designated as CMAs, and no new appropriations are allowed.
- Besides quantitative estimates of supply and demand, numerous other challenges affect the ability of a region to have adequate water supplies in place. Water supply challenges include the need for adequate funding and resources for infrastructure projects, water quality issues, location and access to water resources, 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 in 2060 under the high and low demand scenarios, and also shows the declining administrative water supply and the drought-adjusted water supply. As presented in Section 5.5, the region's administrative water supply is 32,814 acre-feet and the drought supply is 18,297 acre-feet. 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, supply shortages are indicated in drought and non-drought years. Because of its significant reliance on a mined basin and partial reliance on surface water, the region is vulnerable to water supply shortages and drought.



* Based on the ratio of the minimum streamflow of record to the 2010 administrative water supply and modeling conducted by the New Mexico Office of the State Engineer.

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.

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Available Supply and Projected Demand

Figure 7-1

As discussed in Section 6.5, the water level decline rates were examined to estimate the future supply with and without a 20-year drought where no recharge occurred in the mined basins. This analysis indicated that future water availability may be only 56 percent of the 2010 supply. Thus the estimated shortage in surface water supply during drought years is expected to be 55 percent or more. Comparing the estimated supply to the projected demand in 2060, the estimated shortage in a decade 2060 drought year is expected to range from 13,000 to 15,000 acre-feet. Table 7-1 summarizes the estimated water use by subregion and the projected water availability.

Table 7-1. Water Use and Estimated Availability in the Tularosa-Sacramento-Salt Basins Water Planning Region

Source	Basin	County	2010 Estimated Water Use (ac-ft/yr)	2060 Estimated Water Availability (ac-ft/yr)	
				No Drought	One 20-Year Drought
Groundwater	Tularosa	Lincoln	650	543	444
	Tularosa	Otero	18,742	12,464	9,611
	Hueco	Otero	95	85	70
	Salt	Otero	3,109	2,930	2,456
Surface water	All four	Lincoln Otero	9,980	9,980	5,489
Groundwater and surface water	All other diversions outside of four mined basins	Lincoln Otero	238	238	227
		Total	32,814	26,240	18,297
Water use as a percentage of 2010 use				80%	56%

ac-ft/yr = Acre-feet per year

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, and the need to maximize limited resources through water conservation and reuse. The Tularosa-Sacramento-Salt Basins region considered a variety of strategies for addressing these water management challenges. As discussed in Sections 5 and 7, the region is very vulnerable to drought, and there is a large gap between projected demands and drought supplies. Consequently, the Tularosa-Sacramento-Salt Basins effort focused on drought planning in addition to overall water resource planning.

This RWP is building on the 2002 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 2002 *Tularosa Basin and Salt Basin Regional Water Plan 2000-2040* recommended the following strategies for meeting future water demand:

- Public education, water planning committee
- Water conservation (municipal)
- Water conservation (irrigation)
  - Improving off-farm (surface water) conveyance efficiency
  - Improving on-farm efficiency
- Restrictions on development
- Supply blending
- Desalination
- State Engineer special administrative areas
- Water quality and water level monitoring
- Stream gage and climate monitoring
- Watershed management
- Rainfall, snowpack augmentation
- Aquifer storage and recovery
- Tularosa Creek reservoir
- Development of fresh groundwater wells (eastern Tularosa Basin is from Alamo Canyon south to Culp Canyon)

The steering committee reviewed each of the strategies and indicated that all except rainfall and snowpack augmentation are still relevant, though some are being refocused as new recommended strategies (Appendix 8-A). Actions that have been completed to implement the strategies identified in the 2002 plan are summarized on Table 8-1.

8.2 Water Conservation

Municipal water use is generally low in the Tularosa-Sacramento-Salt Basins Water Planning Region, and water conservation programs are already in place, many having been implemented as recommended in the 2002 accepted plan (Section 8.2); therefore, few new water conservation projects are included in this RWP update. However, water conservation will continue to be included in all future water planning efforts in the region and water providers will continue to implement their existing water conservation programs and drought contingency ordinances. As shown in Table 8-1, several water conservation projects have been completed since the original plan was accepted in 2004.

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

In addition to continuing with strategies from the previous plan, the Tularosa-Sacramento-Salt Basins 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 Tularosa-Sacramento-Salt Basins 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.

8.3.1 Comprehensive Table of Projects, Programs and Policies

Over the two-year update process, seven meetings were held with stakeholders in the Tularosa-Sacramento-Salt Basins 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.

Table 8-1. Implementation Status of Strategies Identified in Accepted Plan Tularosa-Sacramento-Salt Basins Water Planning Region
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Strategy	Status
Public education, water planning committee	Children's water festivals take place annually in Alamogordo.
	Alamogordo hosts an annual Community Earth Day Festival supporting all types of conservation.
Water conservation (municipal)	Holloman Air Force Base (AFB) is now 100% xeriscaped and is replacing aging infrastructure (5 miles of water mains), reducing consumption by 18% and using leak detection to prioritize repairs.
	Alamogordo reservoirs are lined and covered to prevent leakage and evaporation.
	Water conservation initiatives have been implemented by many water providers in the region.
Water conservation (irrigation)	
• Improving on-farm efficiency	Irrigation Water Management Workshop was held in Alamogordo in 2007.
• Improving off-farm (surface water) conveyance efficiency	Sustainable Agriculture Workshop was held in Alamogordo in 2011.
Restrictions on development	Alamogordo building ordinance requires refrigerated air conditioners.
Reclaimed water	Cloudcroft Potable Wastewater Reuse System is under construction.
	Holloman AFB converted their golf course to reclaimed water, reducing demand by more than 70million gallons (215 acre-feet) per year.
	Alamogordo uses reclaimed water to irrigate all green spaces (parks, golf course, etc.).
Supply blending	Several water suppliers blend different sources of supply to improve overall water quality.
Desalination	The Alamogordo Desalination Treatment Facility is at the 90% design phase. Bidding for construction is expected in August.
	A Brackish Water Work Group was developed under the Governor's Drought Task Force.
State Engineer special administrative areas	The New Mexico Office of the State Engineer (NMOSE) extended the boundaries of the Tularosa Underground Water Basin in September 2005.
	The Alamogordo Tularosa Administrative Area Guidelines were updated February 12, 2014.
Water quality and water level monitoring	Water level monitoring studies completed with New Mexico Bureau of Geology and Mineral Resources (NMBGMR) include Sacramento Mountains (2012), Tularosa Basin (2014), and White Sands National Monument (2014).
	Water level monitoring with NMBGMR is ongoing in Tularosa Basin.

Table 8-1. Implementation Status of Strategies Identified in Accepted Plan Tularosa-Sacramento-Salt Basins Water Planning Region
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Strategy	Status
Water quality and water level monitoring (cont.)	White Sands National Monument completed an inventory of water rights and groundwater evaluation data with John Shomaker & Associates, Inc. (2011).
	Knowledge and Understanding of the Hydrogeology of the Salt Basin in South-Central New Mexico and Future Study Needs was published by the U.S. Geological Survey (USGS) in 2006.
	Simulation of Ground-Water Flow in the Basin-Fill Aquifer of the Tularosa Basin, South-Central New Mexico, Predevelopment through 2040 was published by USGS in 2004.
Stream gage and climate monitoring	Weather station in Sixteen Springs was added to the National Weather Service system.
Watershed management	Funding was received, primarily from the Federal Emergency Management Agency (FEMA), for recovery of the Bonito Lake following the fire in that area.
	Two Goats Watershed Restoration, a joint program of the U.S. Forest Service (USFS) and City of Alamogordo, will treat 7,700 acres of 14 high-priority watershed areas on public land.
	A Collaborative Forest Restoration Program is being conducted by the City of Alamogordo Westside Watershed Restoration Planning on 8,146 acres of USFS lands.
	Hydrogeologic studies have been completed by NMBGMR for the Sacramento Mountains and northeastern Tularosa Basin.
	In 2015 NMBGMR completed the Sacramento Mountain Watershed Study to assess the effects of thinning to influence aquifer recharge.
	State Forestry has completed projects in High Rolls, Karr Canyon, Pine Springs, and Timber, thinning hazardous fuels from 625 acres.
	New Mexico State Forestry assisted 78 landowners in the Wildland Urban Interface in reducing their risk of catastrophic fire by completing thinning projects.
	Otero Soil and Water Conservation District (SWCD) received funding for the installation of erosion control structures in Wills Canyon to hold sediment and allow moisture to be retained.
	Otero SWCD received funding for improvements on the Upper North Fork Fresnal Acequia. This project improved spring flows by removing old vegetation.
	Otero SWCD, in conjunction with the City of Alamogordo, New Mexico Department of Transportation, and Otero County Electric, received funding for improvements on the North Fork Fresnal Acequia to clear brush and remove obstructions on 3 miles of open ditch.

Table 8-1. Implementation Status of Strategies Identified in Accepted Plan Tularosa-Sacramento-Salt Basins Water Planning Region
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Strategy	Status
Rainfall, snowpack augmentation	This is no longer considered a viable alternative.
Aquifer storage and recovery	No new aquifer storage and recovery studies or projects have been completed in the region.
Tularosa Creek reservoir	The Village of Tularosa and Tularosa Creek Ditch Company have requested funding to begin feasibility and planning studies.
Development of fresh groundwater wells	Well exploration and drilling have taken place throughout the planning region.

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 Tularosa-Sacramento-Salt Basins 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 Tularosa-Sacramento-Salt Basins region, projects identified on the PPP table are primarily data collection and monitoring, watershed restoration and evaluation, and water system infrastructure. Because municipal water use is generally low and 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 and drought contingency ordinances.

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 to 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 to determine the projects of greatest interest and to identify opposition to proposed projects. Key collaborative projects identified by the steering committee and Tularosa-Sacramento-Salt Basins region stakeholders are shown on Table 8-2.

Table 8-2. Key Collaborative Strategies
2016 Tularosa-Sacramento-Salt Basins Regional Water Plan

Project Description	Project Lead	Project Partners	Probable Funding Source(s)	Cost Range	Major Implementation Issues
Forest Health and Watershed and Stream Restoration					
Landscape-scale forest and watershed restoration for 500,000 acres in Otero County to limit catastrophic fires, mitigate negative effects of wildfire, and protect and restore water quality. The project includes: • Reducing the sedimentation/siltation within the Upper Rio Peñasco Watershed • Thinning 19,000 acres to improve watershed health and resiliency and to reduce fire risk • Prescribed fire treatments (17,000 acres) in Perk/Cuevo, Westside, 16 Springs, and Sacramento River Watersheds. • Prescribed fire maintenance in Bent area • Stream restoration planning and implementation on Agua Chiquita and Upper Rio Peñasco	• Otero County Working Group • Otero Soil and Water Conservation District (SWCD) • USFS Sacramento Ranger District	• U.S. Forest Service (USFS) • Bureau of Land Management (BLM) • National Park Service (NPS) • Natural Resources Conservation Service (NRCS) • Fort Bliss • State Land Office (SLO) • New Mexico State Forestry • New Mexico Game & Fish • Otero SWCD Otero County • Otero Electric • South Central Mountain Resource Conservation & Development Council • Private landowners • BLM Las Cruces District Office • USFS Sacramento Ranger District • Bureau of Indian Affairs (BIA), Mescalero Apache, Bent Tularosa, Alamogordo • Timberon, Sunspot, Apache Point	• Collaborative Forest Restoration Program (CFRP) • New Mexico State Forestry • New Mexico Environment Department (NMED) 319 and Rivers • Stewardship Program • Water Trust Board • U.S. Department of Agriculture (USDA) • New Mexico Game & Fish	Depends on project size. Restoration projects can cost approximately $2,000 to 5,000 per acre.	• Lack of funding • Challenges in engaging landowners Legal/permitting and social obstacles to using prescribed fire Cost of logging versus the value of timber • Climate and weather (drought and wildfires) Cross-jurisdictional planning and coordination; need state-level planning and prioritization and incentives • Public education regarding need for watershed health • Limited local capacity for planning and National Environmental Policy Act (NEPA) compliance

Table 8-2. Key Collaborative Strategies 2016 Tularosa-Sacramento-Salt Basins Regional Water Plan

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Project Description	Project Lead	Project Partners	Probable Funding Source(s)	Cost Range	Major Implementation Issues
Data Collection and Monitoring, Data Analysis, and Aquifer Mapping					
• Establish Basin Water Committee to facilitate the sharing of information regarding water issues with representatives from all types of water users. • Continue regional water planning for data sharing and implementation. • Identify resources and needs in Salt Basin area.	• Otero County • NMED	• Otero Working Group • Otero County • Regional water planning steering committee	• Counties • NMED • New Mexico Interstate Stream Commission (NMISC)	$5,000 (administrative support to set up and facilitate meetings)	• Identifying committee project lead • Need to coordinate with existing local water planning initiatives
• Develop brackish water use for potable supply.	• NMED	• Brackish Water Work Group under the Governor's Drought Task Force • City of Alamogordo		$100,000	Lack of funding
• Develop an atlas of water availability in areas experiencing shortages and water level declines.	• New Mexico Tech	• Fort Bliss • La Luz Mutual Domestic Water Association (MDWA) • U.S. Geological Survey (USGS)	Capital Outlay	$25,000 – $100,000	Lack of funding
• Map freshwater and brackish water. Determine the distribution of fresh and brackish water resources using magnetotellurics and transient electromagnetic methods.	• Otero SWCD • Otero County	• New Mexico Tech • Otero County	• Capital Outlay • County funds	$70,000	

Table 8-2. Key Collaborative Strategies 2016 Tularosa-Sacramento-Salt Basins Regional Water Plan

Project Description	Project Lead	Project Partners	Probable Funding Source(s)	Cost Range	Major Implementation Issues
Agricultural Efficiency and Improvements					
• Irrigated agricultural water conservation • North Fork Fresnal ditch pipeline maintenance or replacement • Laser leveling • Lining ditches with concrete • Pressurized sprinklers and drip irrigation systems • Metering of agricultural water	Otero-Lincoln Farm Service Agency	• NRCS • Acequias and agricultural water users	• Capital Outlay • NMISC acequia program • U.S. Department of Agriculture (USDA)	Project-specific	Cost and lack of funding
Regionalization and Capacity Building for Mutual Domestics and Small Water Systems					
To strengthen the capacity of many small systems: • Investigate opportunities for collaborative regional support for management and potential interconnection. • Develop capacity for metering, maintenance of infrastructure, and extension of lines and tank. • Conduct water audits on all systems. • Conduct leak detection, which is critical to reduce water loss.	NMED	• Alamogordo: Dungan, Alamo Heights, and Canyon Hills • High Rolls, Kerr Canyon, Waterfall, Chippeway, and Cloudcroft • Individual water systems • Timberon • Enchanted Valley • Oro Grande • Canyon Hill • Rolling Hills • La Luz MDWA	• Water Trust Board • State Capital Outlay • USDA • NMED technical assistance	Project-specific	• Bringing people together to work collaboratively • Funding

Table 8-2. Key Collaborative Strategies
2016 Tularosa-Sacramento-Salt Basins Regional Water Plan

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 of additional water lines • Sewer system installation and upgrade • Storage tank rehabilitation or installation • Water rights acquisition • Planning documents, source water protection plans, and preliminary engineering reports for water providers in the region that don't have these.	Water systems identified in Appendix 8-A	NMED	• Capital Outlay • Water Trust Board	$150,000	Funding

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 Tularosa-Sacramento-Salt Basins region identified the following recommendations for PPPs to be considered in the state water plan:

- Present RWP program and project needs to the legislative interim water and agriculture committee.
- Provide $1 million per region in State funds for implementation; larger regional programs would have another source of money for their projects. NMISC could be the lead on this. This could be modeled after the Colonias funding program, which along with a federal match went from $15 million to $45 million.
- Define agricultural water use and what constitutes waste of agricultural water.
- Define goal of sustainable groundwater for each groundwater basin that is being mined.
- Continue ongoing water data collection, aquifer mapping, and water quality monitoring.
- Develop an integrated water monitoring and data sharing program for all the water planning regions.
- Set up interregional cooperative working groups to address common interests and issues and to identify opportunities for collaboration.
- Evaluate geographical boundaries of existing water planning regions to identify areas where it may be appropriate to adjust boundaries based on local considerations (e.g., a water system or community that is separated into two different planning regions).

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

Tularosa-Sacramento-Salt Basins Region 5 RWP Master Stakeholder List

Updated May 20, 2016

Last	First	Affiliation / Category
Allen	Elaine	Commissioner Lincoln County
		Heart of the Desert, Inc. at Eagle Ranch
Antwine	Eddie	SWCD Otero County
Baca	Robert	Rosalio Lopez Ditch & TCD
Baish	Rick	Vice-Chairman Otero SWCD
Baldwin	Jason	City Councilor Alamogordo
Banks	April	White Sands Missile Range
Bass	Ken	KALH Radio
Blevins	Lisa	Public Affairs White Sands Missile Base
Blough	Kelly	Ft. Bliss
Boles	Wanda	Boles Acres Water System
Bookout	Norvell	Tularosa Chamber of Commerce
Boykin	Doug	NM State Forestry
Brown	Larry	High Rolls Community Water Users Coop
Bustos	David	White Sands National Monument, National Park Service
Cadwallader	James	Fresnal Acequia Tularosa Ditch
Calkins	Diana	Farmer
Calkins	Ian	PR Contact, Copperstate Consulting Group
Capper	Joe	Cedar Creek Cabin Owners Assn
Cartwright	Mike	Chippeway Water Users Assn
Cathey	Craig	Office of the State Engineer
Cesar	Brian	Public Works Director
Chambers	Joe	Administrator, MDWCA
Chace	David	HydroResolutions, LLC
Childress	William	BLM
Cooksey	Ron	Trustee, Village of Tularosa
Coburn	Teresa	
Cordova	Ray	Mayor, Tularosa Southeastern New Mexico Economic Development District
Cornell	John	Sportsman Coordinator, New Mexico Wildlife Federation
Crawford	Archie	Canyon Hills MDWCA
Cusack	Ciara	BLM
Dark	Jay	Cider Mill Farms MDWCA
Davidson	Jack Allen	Supervisor, Carrizozo SWCD Board
Daviet	Greg	NM Pecan Growers
Dean	Ray	Trustee, Village of Carrizozo
Derrick	Daryl	Waterfall Community Water Users Assn (Rio Grande)

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.

Tularosa-Sacramento-Salt Basins Region 5 RWP Master Stakeholder List

Updated May 20, 2016

Last	First	Affiliation / Category
Dominguez	Tom	NMSU Coop Ext.
Doth	Laura	South Central Mountain Resource Conservation & Development Council
Doth	Mark	Lincoln County Commissioner
Draper	Dallas	Commissioner Lincoln County
Duggar	Greg	President Last Chance Water Co, Principal, Duggar Water Development
Duran	James	Forest Service Lincoln National Forest, Sacramento Ranger District
Durr	Corey	BLM
Emmer	Katie	Copper Flat Mine
Espiritu	Mike	Otero County Economic Development Council, Inc.
Ford	Clarice	NRCS Rangeland Management Specialist
Foreman	Alan	Laborcita Water Users Association
Galea	Susie	Mayor, City of Alamogordo
Gallacher	Gray	Supervisor, Carrizozo SWCD
Gallegos	Jose	White Sands Missile Base
Garcia	Carol	La Luz MDWCA (Rio Grande)
Garcia	Patrick	Trustee Village of Tularosa
Grider	Jim	Vice-Chairman Carrizozo SWCD Board
Griffin	David	Holloman AFB
Guilez	Dianna Brusuelas	Village of Tularosa Village Clerk Tularosa Water
Gustafson	Diane	Karr Canyon Estates
Gutierrez	Rick	Village of Tularosa
Gutierrez	Sam	NRCS
Hale	Stephanie	Commission Liaison Otero County
Ham	Linda	Loma Grande Estates Water Assn
Haraden	Pete	Hydrologist USDA Forest Service
Harkey	Steve	Secretary/Treasurer Carrizozo SWCD Board
Hart	Kathie	Mt. Pktrout Farm
Hartung	John	NRCS
Heltner	Pamela	County Manager Otero County
Hernandez	Alfonso	City Commissioner Alamogordo
Herrera	Phil	NRCS
Hobson	Maurice	Tularosa Ditch
Hodgkinson	Phillip	Dungan MDWCA
Holmes	Sharon	Oasis Mobile Home Park
Hoover	Eldon	Orogrande MDWCA
Hunter	Rex	National Solar Observatory

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.

Tularosa-Sacramento-Salt Basins Region 5 RWP Master Stakeholder List

Updated May 20, 2016

Last	First	Affiliation / Category
Irby	Wendy	
Johnson	Melvin	Chairman Carrizozo SWCD Board
Jones	Bobby	NM Cattle Growers Association
Joyce	Kendall	Three Rivers Cattle Ltd
Kemp	Richard	Rolling Hills WUA
Kerns	Junior	White Sands
Kirby	David	
Kipp, Ph.D.	John	NEPA Planner, Conservation Branch Environmental Division Directorate of Public Works
Lerner	Karen	Tularosa Community Ditch Corp.
Levine	Lacy	NM Department of Agriculture
Lister	Leticia	BLM
Livers	James	Boothill RV
Livingston	Sharon	Low Mesa MDWCA in Dog Canyon
Locke	Brian	Ft. Bliss Wildlife Biologist
Longmire	Raquel	Lieutenant, Air Force
Lovelace	Lynn	District Forester NM State Forestry
Lueras	Edward	La Luz MDWCA
Mamer	Ethan	NM Tech
McDonald	Micky	Senior Vice President, First American Bank
Mendez	Thomas	Mescalero Apache Tribe
Mercer	David	OSE
Merrick	Rick	South Central Mountain Resource Conservation & Development Council
Mershon	Bill	Chairman Otero SWCD
Miller	Ashley	White Sands Mid Range Facilities- FF
Milne	Vickie	District Manager Otero SWCD
Minter	Kathryn	Commissioner Lincoln County
Moore	Doug	
Morales	Olga	Rural Development Specialist, RCAC
Morrow	Patrick	White Sands Missile Range
Moseley	Travis	Supervising Officer U.S. Forest Service
Muncy	Lynn	County Executive Otero County Farm Service Agency
Nelson	Teresa	Realtor, Coldwell Banker - Nelson Team
Nichols	Bob	Otero County SWCD
Nielson	Laura	Holloman Air Force Base
Nivison	Mike	County Commissioner, former Mayor of Cloudcroft and former Administrator of Cloudcroft.

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.

Tularosa-Sacramento-Salt Basins Region 5 RWP Master Stakeholder List

Updated May 20, 2016

Last	First	Affiliation / Category
Norwood	Kelly	White Sands Missile Range
Nunnelley	Dave	City of Alamogordo
Padilla	Thora	Mescalero Apache Tribe
Parker	Dara	Field Representative, Senator Martin Heinrich
Payne	Bobby	Alamo Heights WUA
Pope	Larry	Fort Stanton Facility
Poovey	Marty (Martha?)	Dog Canyon, Low Mesa WUA
Poster	Bruce	Demographics & Population Consultant
Powell	Jackie	
Quairoli	Paul	Emergency Services
Quintana	Hubert	Executive Director Southern NM Economic Development District
Quintana	Nash	Enchanted Forest Water Corp
Rardin	Ronny	Commissioner Otero County
Rabon	Jeff	Otero Soil and Water Conservation District
Rawling	Jeffrey	NM Bureau of Geology
Renteria	Adrian	Souder, Miller & Associates
Rentschler	Robert	Mayor Pro-Tem City of Alamogordo
Roberts	Michael	Piney Woods WUA
Roberts	Randy	HydroResolutions
Rodriguez	Alicia	White Sands Missile Range
Roper	Barbie	Program Director Soil & Water District
Rotert	Rick	Nogal MDWCA
Ruiz	Carol	USDA, Otero-Lincoln Farm Service Agency
Ruiz	Julie	OSE
Sainz	Robert	Trustee Village of Tularosa
Salas	Carlos	La Luz MDWCA
Sanchez	Ray	La Luz MDWCA
Sauter	Marie Frias	Superintendent White Sands National Monument
Savage	Joe	NMED
Sikes	Nadia	City Councilor Alamogordo
Stahle	Jim	City of Alamogordo
Stone	Preston	Commissioner Lincoln County
Straface	Dr. George	City Commissioner Alamogordo
Tafoya	Adrian	District Conservationist NRCS
Taylor	Nita	Lincoln County Manager
Telles	Ron	Trustee Village of Tularosa

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.

Tularosa-Sacramento-Salt Basins Region 5 RWP Master Stakeholder List

Updated May 20, 2016

Last	First	Affiliation / Category
Temple	Curt	Planning Director, Lincoln County
Thies	Stephen	City of Alamogordo
		Heart of the Desert, Inc. at Eagle Ranch
Thornton	Joe	Carrizozo Water System
Timmons	Stacy S.	Aquifer Mapping - Interim Program Manager NM Bureau of Geology
Toler	Rebecca	Program Coordinator Upper Hondo Soil & Water Conservation District
Turnbull	Jenny	City Commissioner Alamogordo
Trujillo	Richard	Office of the State Engineer
Turri	Jinni	Cloudcroft Water System
Venable	David	Mayor, Village of Cloudcroft
Villaverde	Gloria	Assistant Professor MESH Division - NMSU
Vann	Carroll	HR Community Ditch
Ward	Ryan	Water Policy Analyst New Mexico Department of Agriculture
Watson	Leslie	Mountain Orchard WUA
Weathers	Pat	Enchanted Valley Water Users
Weatherwax	Larry	Director, Workforce Connections
Weihbrecht	Leann	Town Clerk, Carrizozo, Carrizozo Water System
White	Janet	Otero County Commission
Whitted	Dougland	Dog Canyon MDWCA
Wimberly	James	Eileen Acres
Wolf	Charles	
Wood	Helen & Bob	
Wyatt	Ron	Timberon Water & Sanitation District (Rio Grande)
		Evergreen Mobile Home Park
		Freeman's / Crossroads Mobile Home Park
		Wright Wimberly Joint Venture

Note: Those interested in developing collaborative projects or ongoing planning efforts may contact the NMISC Regional Water Planning Manager for further information about the region's stakeholders.

Appendix 2-B

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

Summary of Comments on State Technical and Legal Sections, Tularosa RWP

NO.	Comment Source	Location (Section/ Page/ Paragraph)	COMMENTS
1	Greg Duggar	Section 1	The Updated Regional Water Plan (2016-2056?), Should expressly state that the Updated Regional Water Plan is not intended to replace or supersede the Tularosa Basin and Salt Basin Regional Water Plan 2000-2014 (Livingston and JSAI, 2002), but update it with more current information. Data and positions should be considered updated or revised only on to the extent they are different from data or positions stated or expressed in the Tularosa Basin and Salt Basin Regional Water Plan 2000-2014 (Livingston and JSAI, 2002).
2	Greg Duggar	Section 1	The Updated Regional Water Plan should be clear that ISC prepared the Introduction and Sections 3, 4, 5, 6, and 7. The information and positions in these portions of the Updated Regional Water Plan do not necessary reflect the views or opinions of the members of the Regional Planning Committee.
3	Greg Duggar	Section 1	The Updated Regional Planning Committee's comments and input in the Updated Regional Water Plan are limited to Section 2, Section 8, and the Projects, Programs, and Policies spreadsheet. Information in the Projects, Programs, and Policies spreadsheet contains information provided by regional entities, which the ISC compiled without revision. (If ISC did revise or not include certain projects, programs, or policies recommended by the Regional Planning Committee, ISC should explain these programs are based on ISC's discretion and do not necessarily reflect the opinions of the Regional Planning Committee).
4	Greg Duggar	Section 2, Table 2-1	Steering Committee Members, should be updated and made consistent with the Tularosa/Sacramento Basin Regional Water Plan Master Stakeholder List dated January 18, 2015. For example, I should be listed as a member of the Steering Committee. I also was a member of the Steering Committee and an active participant in the Tularosa Basin and Salt Basin Regional Water Plan 2000-2014 (Livingston and JSAI, 2002).
5	Greg Duggar	Section 3	Being a Member of the Steering Committee from the Salt Basin for both the original plan and this update, I believe a much better approach on water supply and water demand in the Updated Regional Water Plan (2016-2056?) is to separate the Tularosa Basin from the Salt Basin as was done in the Tularosa Basin and Salt Basin Regional Water Plan 2000-2014 (Livingston and JSAI, 2002). Both basins are hydrologically distinct and differ greatly in water supplies and water demand. The Updated Regional Water Plan groups the basins together and reports most data as a single planning region or by county. This is not particularly useful or good for either basin, and the data should be disaggregated and discussed separately. If the basins are not evaluated and discussed separately in the Updated Regional Water Plan, people looking for specific data and information on each of the basins, as opposed to the region, will have no choice but to refer back to the Tularosa Basin and Salt Basin Regional Water Plan 2000-2014 (Livingston and JSAI, 2002).
6	Greg Duggar	Section 3	All of the text, figures, and tables should be revised to show data and a representation of the Tularosa and Salt basins separately.

Summary of Comments on State Technical and Legal Sections, Tularosa RWP

NO.	Comment Source	Location (Section/ Page/ Paragraph)	COMMENTS
7	Greg Duggar	Section 4	The Updated Regional Water Plan should make clear that the interpretation of the cases and statutes in Section 4 are the views of the ISC and do not necessarily reflect the same views as the Regional Water Planning Committee.
8	Greg Duggar	Section 5	There is a paragraph that states: "Currently, some of the key water supply updates and issues impacting the Tularosa-Sacramento-Salt Basins region are:" followed by 8 bullets. One bullet states that the "Salt Basin is being considered by some entities as a water source to augment supplies in southwest Texas. If the water resources of the Salt Basin are appropriated to supply southwest Texas, it would deprive southern New Mexico of a future water source for the satisfaction of future demands." This bullet is very misleading. No new applications have been filed since the Tularosa Basin and Salt Basin Regional Water Plan 2000-2014 (Livingston and JSAI, 2002), and there has been no activity on pending applications since then either. If this is a reference to the Last Chance Water Company application, it is also misleading. LCWC's application is to use Salt Basin groundwater within the Salt Basin, outside of the Salt Basin in New Mexico, or Texas. LCWC has made clear to ISC that its preferred place of use is in New Mexico if the water can be utilized here. Any place of use outside of New Mexico is only if New Mexico does not have interest in or want the water. Perhaps this is a reference to ISC's application in the Salt Basin which has a purpose of use as "augmentation of deliveries required under interstate stream compacts", meaning the water from the Salt Basin could go to Texas. Given there has been no activity on any of the applications since the original Regional Water Plan, the best course is probably to remove this bullet rather than mischaracterize either application, especially since it doesn't provide any meaningful update. If ISC insists on keeping the bullet, it has to be edited to make it accurate.
		Proposed revision approved by the Steering Committee.	Salt Basin is being considered by some entities as a water source to augment supplies in southwest Texas. Water resources in the Salt Basin should be used for multiple benefits of the State of New Mexico.
9	White Sands National Monument	References	Please add this reference. Bourret, Suzanne Michelle. *Stabilization of the White Sands gypsum dune field, New Mexico, by groundwater seepage: A hydrological modeling study* . New Mexico Institute of Mining And Technology, 2015.
10	White Sands National Monument	References	Please add this reference. Newton, B. Talon, and Bruce Allen. *Hydrologic Investigation at White Sands National Monument* . New Mexico Bureau of Geology and Mineral Resources, Aquifer Mapping Program, 2014.

Summary of Comments on State Technical and Legal Sections, Tularosa RWP

NO.	Comment Source	Location (Section/ Page/ Paragraph)	COMMENTS
11	White Sands National Monument	References	Please add this reference. Embid, Eileen H. and Finch, Steven. T. *White Sands National Monument Inventory of Water Rights and Groundwater Evaluation Data,* John Shomaker and Associates, Inc, 2011.
12	Vicky Milne		Include USGS report on the Salt Basin in the report: http://pubs.usgs.gov/of/2006/1358/
13	Bobby Jones, Chairman for the Otero County Grazing Advisory Board		As the list of projects became more prioritized and combined, it appeared some of the most critical for all involved would be those dealing with watershed restoration. In implementing watershed restoration, the consultation with people on the land for their concerns and ideas are paramount. Many of these rural inhabitants do as much as their personal finances allow to help the watersheds through erosion control or brush control and thinning. In the future, should additional water become necessary for urban areas or villages, care should be taken to maintain water requirements for the agricultural needs, while appropriating the surplus water for other public needs.
14	Bobby Jones, Chairman for the Otero County Grazing Advisory Board		On a final note, I wish to reiterate, in their entirety, the comments submitted by Greg Duggar, LCWC. I agree with the points contained in Mr. Duggar's comments. I also believe that the Salt Basin should be separated from the Tularosa-Sacramento Basins and be dealt with as a unique and separate entity. The indications found in the work done by David Chase as a hydrologist for Sandia Labs makes this separation from the others as very distinct probability due to the hydrology and geology of the Salt Basin itself.
15	Victoria A. Milne, Otero SWCD	General	As stated in the introduction, "The purpose of this document is to update the 2002 RWP to reflect new and changed information related to water planning in the Tularosa-Sacramento-Salt Basins region..." I believe every effort should be made to include references to the "new" information. The New Mexico Bureau of Geology and Mineral Resources has completed four studies, six maps (geologic and water tables), and an ongoing hydrological modeling study within this planning region. Only two references to these studies were found in the draft document. I have prepared draft sentences for your consideration, they are included in the edits below.
16	Victoria A. Milne, Otero SWCD	3.1, first paragraph, last sentence	The "village" of Cloudcroft...
17	Victoria A. Milne, Otero SWCD	3.3, first paragraph, first sentence	Alamo "stream"...

Summary of Comments on State Technical and Legal Sections, Tularosa RWP

NO.	Comment Source	Location (Section/ Page/ Paragraph)	COMMENTS
18	Victoria A. Milne, Otero SWCD	5.3.1, third paragraph, second sentence	The four sub-basins are listed as 1) northern, 2) eastern, 3) western, and 4) Salt Basin. The following paragraphs are not in sequence with this listing. They are presented 1) northern, 2) western, 3) eastern, and 4) Salt Basin. It seems like they should be presented in the order they are listed or vice versa. The following edits are based on the current placement of the paragraphs.
19	Victoria A. Milne, Otero SWCD	5.3.1, fourth paragraph, last sentence	"A recent study conducted by the NM Bureau of Geology and Mineral Resources focused on understanding the groundwater resources in this region by identifying recharge areas and quantities, determining groundwater flow rates and direction, and to interpret the groundwater/ surface water interactions that exist in the region (Mamer et al., 2014)."
20	Victoria A. Milne, Otero SWCD	5.3.1, fifth paragraph, new fourth sentence	"In 2010, a hydrology study was initiated at White Sands National Monument to evaluate sources of recharge to the shallow aquifer within the sand dunes and its interconnection with the deep, regional aquifer to help preserve and manage this unique natural resource (Newton et al., 2014)."
21	Victoria A. Milne, Otero SWCD	5.3.1, seventh paragraph, new sixth sentence	"Chemistry, stable isotope and groundwater age date indicate that a significant portion of groundwater recharge to the Pecos Slope, Roswell Artesian Basin, and Salt Basin is derived from subsurface groundwater flow from the high mountain aquifer system in the Sacramento Mountains (Newton et al., 2012)."
22	Victoria A. Milne, Otero SWCD	5.3.1, seventh paragraph, replace last sentence	"Groundwater in the carbonate aquifer is generally very hard and TDS concentrations generally range from 500 to 6,500 mg/L (Huff and Chace, 2006)."
23	Victoria A. Milne, Otero SWCD	5.3.2, first paragraph, new fifth sentence	"Modeling studies predict the aquifer in the vicinity of Alamogordo and Tularosa will experience an average annual water-level decline of more than 2 feet per year over the planning period (10 years) due to the full exercise of existing permits and declarations (Emid and Finch, 2011)."
24	Victoria A. Milne, Otero SWCD	5.3.2, fourth paragraph, third bullet	The NM Bureau of Geology and Mineral Resources estimated local recharge of 68,000 acre-feet/year (AFY), of which only 45,500 AFY enters the basin from streams and runoff (Mamer et al., 2014)."
25	Victoria A. Milne, Otero SWCD	6.2.2, fourth paragraph, second sentence	White Sands Missile "Range".

Summary of Comments on State Technical and Legal Sections, Tularosa RWP

NO.	Comment Source	Location (Section/ Page/ Paragraph)	COMMENTS
26	Victoria A. Milne, Otero SWCD	References	Embid, Eileen H. and Finch, Steven. T. 2011. White Sands National Monument Inventory of Water Rights and Groundwater Evaluation Data, John Shomaker and Associates, Inc., 2011. Huff, G.F. and Chace, D.A. 2006. Knowledge and Understanding of the Hydrogeology of the Salt Basin in South-central New Mexico and Future Study Needs, US Geological Survey Open File Report 2006-1358, 2006. Newton, B. Talon, and Bruce Allen. 2014. Hydrologic Investigation at White Sands National Monument. New Mexico Bureau of Geology and Mineral Resources, Aquifer Mapping Program Open-File Report 559, 2014. Newton, B. Talon. G. C. Rawling, S.S. Timmons, L. Land, P. S. Johnson, T. J. Kludt, and J.M. Timmons. 2012. Sacramento Mountains Hydrogeologic Study: Final technical report. Prepared for Otero Soil and Water Conservation District. New Mexico Bureau of Geology and Mineral Resources, Aquifer Mapping Program Open-File Report 543, 2012.

Appendix 6-A

List of Individuals Interviewed

Appendix 6-A. List of Individuals Interviewed Tularosa-Sacramento-Salt Basins Water Planning Region

Name	Title	Organization	City
Pamela Heltner	County Manager	Otero County	Alamogordo
Ian Calkins	PR contact	Copperstate Consulting Group	Phoenix, AZ
Larry Weatherwax	Director	Workforce Connections	Alamogordo
Teresa Nelson	Realtor	Coldwell Banker – Nelson Team	Alamogordo
Jim Stahle	City Manager	City of Alamogordo	Alamogordo
Jackie Powell	County Commissioner	Lincoln County	Carrizozo
Nita Taylor	County Manager	Lincoln County	Carrizozo
Leann Weighbrecht	Town Clerk	Town of Carrizozo	Carrizozo
Mickey McDonald	Senior Vice President	First American Bank	Alamogordo
Raquel Longmire	Lieutenant	Air Force	Holloman AFB
Mike Espiritu	President	Economic Development Council	Alamogordo
Adrian Tafoya	District Conservationist	USDA - NRCS	Las Cruces
Curt Temple	Planning Director	Lincoln County	Ruidoso
Nita Taylor	County Manager	Lincoln County	Carrizozo

Appendix 6-B

Projected Population Growth Rates, 2010 to 2040

Appendix 6-B. BBER Projected Five-Year Population Growth Rates, 2010 to 2040 Tularosa-Sacramento-Salt Basins Water Planning Region

County	Five-Year Growth Rate (%)					
	2010-2015	2015-2020	2020-2025	2025-2030	2030-2035	2035-2040
Otero	1.97	1.26	0.69	0.33	0.03	–0.33
Lincoln	NA	NA	NA	NA	NA	NA

Source: New Mexico County Population Projections, July 1, 2010 to July 1, 2040.
Geospatial and Population Studies Group, Bureau of Business & Economic Research,
University of New Mexico. Released November 2012.

NA = Population growth estimated for entire counties only.

Appendix 8-A

Recommended Projects, Programs, and Policies

Regional Water Planning Update

Projects, Programs, and Policies

Water Planning Region 5: Tularosa-Sacramento-Salt Basins

County	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
Otero	R	Project	Watershed Restoration	Collaborative Forest Restoration Program	City of Alamogordo	Watershed plan (Westside Sacramento Mountains Watershed Restoration and Fuels Reduction Plan: http://ci.alamogordo.nm.us/Assets/Grant+Application+Narrative.pdf)	City of Alamogordo	TBD	FY2017				
Otero	R	Project	Watershed Restoration	Alamogordo Watershed Hydrologic Model	City of Alamogordo, water planning meeting	Model to assess the effects of different land use practices and forest restoration activities on watersheds in the Sacramento Mountains.	City of Alamogordo	USFS		Conceptual development			
Otero	R	Project	Watershed Restoration	Existing Wells, springs, and stream monitoring for water quality and quantity	City of Alamogordo, water planning meeting	Long-term monitoring of existing wells, springs, and streams for water quality and quantity.	City of Alamogordo	USFS, USGS	Long-term	Conceptual development		Aquifers underlying the Tularosa and Salt Basins need to be monitored. Existing data points should be maintained. If funding is found, additional monitoring locations should be chosen.	
Otero	R	Project	Data Collection	Fort Bliss Hydrogeologic Atlas	Ft. Bliss	From existing data, interpret and produce installation-wide hydrogeologic atlas.	Ft Bliss	USGS	2016-2017	Data analysis		Monitor water availability for use in planning and operations.	
Otero	R	Project	Planning	Sustainable Sources of Water	NMED, water planning meeting	Source water protection plans are needed for smaller systems to sustain the watersheds and aquifers used for potable water.	Individual water systems, unless a regional water authority is formed	NMED, OSE, USFS, BLM		Conceptual development		Sustain the watersheds and aquifers used for potable water	
Otero	R	Project	Water System Infrastructure	Small Public Water System Infrastructure Improvement Projects	NMED, water planning meeting	10 small community systems with high water loss due to aging and failing infrastructure.	Individual water systems, unless a regional water authority is formed	NMED, COGs	Short (>5 yrs) and long term (<5 yrs)	Conceptual development	Rough estimate of $30 million; Timberon estimates $46 million for their system	Failing infrastructure	
Otero	R	Project	Watershed Restoration (thinning)	Prescribed Fire Maintenance, Bent, NM	Ricky Cox, Fuels Specialist	Prescribed fire maintenance of approximately 2,000 acres north of Bent, NM along Mescalero reservation boundary	LCDO Fuels Program	USFS, DOD, BIA, Mescalero Apache Tribe, Bent, Tularosa, Alamogordo, NM State Land Office, NM State Forestry	Completed by Fall 2019	Initial planning phase of Tularosa watershed, western boundary LNF "neck" area.		Improve watershed health and resiliency. Reduce fire risk.	
Otero	R	Program	Data Collection and Planning	Brackish Water Use for Potable Water Supply - Data Collection and Public Outreach	NMED, water planning meeting	Support the Brackish Water Workgroup to inventory brackish water reserves in the Tularosa Basin and statewide and to support public outreach efforts.	NM Energy, Minerals and Natural Resources Department (NMEMNR) and NMED	Office of the State Engineer (OSE) and Bureau of Geology, New Mexico Institute of Mining and Technology	FY2016	Data collection in progress. Funding for large study is underway.	$100,000	Work is to support the Brackish Water Workgroup under the authority of the Governor's Drought Task Force.	Initial data collection SFY16; Public Outreach and additional data collection in SFY17 and SFY18.
Otero	R	Policy	Development of a regional water planning authority between local communities	Investigate Opportunities for Regionalization and Development of a Water authority in the water planning region	NMED, water planning meeting	Regionalization of water systems within close proximity to Alamogordo: Dungan, Alamo Heights, Canyon Hills, and non-community water systems.	NMED and Dungan, Alamo Heights, Canyon Hills Communities	Local Council of Governments and OSE		Phase 1		Creation of a regional authority will allow for water use agreements on a regional level as well as provide for new funding opportunities of potential projects.	
Otero	R	Policy	Development of a regional water planning authority between local communities	Investigate Opportunities for Regionalization and Development of a Water authority in the water planning region	NMED, water planning meeting	Regionalization to include mountain communities such as High Rolls, Kerr Canyon, Waterfall, Chippeway, Cloudcroft, etc.	NMED and High Rolls, Kerr Canyon, Waterfall, Chippeway, Cloudcroft communities	Local Council of Governments and OSE		Phase 3		Creation of a regional authority will allow for water use agreements on a regional level as well as provide for new funding opportunities of potential projects.	
Otero	R	Policy	Development of a regional water planning authority between local communities	Investigate Opportunities for Regionalization and Development of a Water authority in the water planning region	NMED, water planning meeting	Regionalization to include most of Tularosa Basin to benefit from desal plant: La Luz, Tularosa, Low Mesa, Dog Canyon, Boles Acres.	NMED and La Luz, Tularosa, Low Mesa, Dog Canyon, Boles Acres communities	Local Council of Governments and OSE		Phase 2		Creation of a regional authority will allow for water use agreements on a regional level as well as provide for new funding opportunities of potential projects.	
Otero	R	Program	Planning	Conservation and Increased Water Efficiency	NMED, water planning meeting	Implement increased outreach programs for water conservation.	NMED and OSE	USEPA, individual public water systems	FY 2016	Conceptual development	$100,000	Conservation and increased water efficiency should be part of an overall water plan and strategy.	
Otero	R	Project	Planning	Assessing Impacts of Pumping and Climate Change on Tularosa Basin Fresh and Brackish Water Resources	Otero SWCD	NM Tech has prepared a scope of work to construct high resolution, three-dimensional models of groundwater flow, heat, and solute transport.	Otero Soil Water Conservation District	NM Tech	FY2016-2018	Planning	$239,832	The products of the model will show groundwater transport (fresh and brackish) across the Tularosa Basin. It will allow for predictions of impacts to groundwater levels and the effects of salinity due to climate change and different pumping scenarios.	2016 - NM State Legislature
Otero	R	Project	Planning	Watershed Hydrologic Modeling of the West-facing slopes of the Sacramento Mountains	Otero SWCD	NM Tech has prepared a scope of work to construct a watershed hydrologic model that simulates important hydrologic processes including precipitation, evapotranspiration, infiltration, and runoff on the west-facing slopes.	Otero Soil Water Conservation District	NM Tech	FY2016-2018	Planning	$114,376	The model will help to assess the effects of different land use practices and forest restoration activities in watersheds in the Sacramento Mountains on the hydrologic system and potential recharge to the regional aquifer in the Tularosa Basin.	2016 - NM State Legislature
Otero	R	Project	Planning	Mapping Fresh and Brackish Resources across the Tularosa Basin	Otero SWCD	NM Tech has prepared a scope of work to determine the distribution of fresh and brackish water resources between depths of 500 m to 10 km using magnetotellurics (MT) and Transient Electromagnetics (TEM) methods. Also included is the development of cross-sectional hydrogeological models to determine the distribution of salinity.	Otero Soil Water Conservation District	New Mexico Institute of Mining and Technology	FY2016-2017	Planning	$110,182	Determine distribution and salinity of water resources for planning purposes.	2016 - NM State Legislature

Regional Water Planning Update

Projects, Programs, and Policies

Water Planning Region 5: Tularosa-Sacramento-Salt Basins

County	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
Otero	R	Program	Watershed Restoration Planning	Otero County Working Group	Otero SWCD	Primary mission to collaborate with communities, partners, and stakeholders to strategically plan, develop, and leverage resources in order to enhance the resiliency and restoration of Otero County Watersheds. This group has identified a priority area of approximately 500,000 acres that includes the most critical areas to implement watershed related projects. Within this area, focus areas have been identified as initially the most critical along with greatest potential to collaborate.	Otero SWCD	USFS, BLM, NRCS, SLO, NM State Forestry, NM Game and Fish, Otero County, SCM RC&D, Private Landowners		Planning		Emergency preparedness and response activities Education and outreach activities On-the-ground practices (thinning, prescribed burning, rangeland and riparian restoration, water quality monitoring) Economic development activities	For Additional Information Contact Rick Merrick, chair of Otero County Working Group, at Tel: 575-937-1789
Otero	R	Project	Watershed Restoration (thinning)	Perk/Perk Cuevo (Jim Lewis EA) Watershed Restoration	Tony McWilliams, Fuels Specialist	2,000 to 3,000 acres of mechanical thinning and up to 10,000 acres of prescribed fire.	Sacramento Ranger District	USFS, BLM, DOD, Timberon, Sunspot, Apache Point, OSWC, Otero Electric, City of Alamogordo, NM State Land Office, NM Game & Fish, NM State Forestry, NRCS	Completed by Fall 2019	Initial planning of Sacramento River Watershed EA		Improve watershed health and resiliency. Reduce fire risk.	
Otero	R	Project	Watershed Restoration (thinning)	Westside Watershed Restoration	Tony McWilliams, Fuels Specialist	7,000 to 10,000 acres of treatment	Sacramento Ranger District	USFS, BLM, DOD, Timberon, Sunspot, Apache Point, OSWC, Otero Electric, City of Alamogordo, NM State Land Office, NM Game & Fish, NM State Forestry, NRCS	Completed by Fall 2019	Initial planning of Sacramento River Watershed EA		Improve watershed health and resiliency. Reduce fire risk.	
Otero	R	Project	Watershed Restoration (thinning)	16 Springs	Tony McWilliams, Fuels Specialist	4,000 to 6,000 acres of mechanical fuels treatment and 3,000 to 7,000 acres of prescribed fire treatment.	Sacramento Ranger District	USFS, BLM, DOD, Timberon, Sunspot, Apache Point, OSWC, Otero Electric, City of Alamogordo, NM State Land Office, NM Game & Fish, NM State Forestry, NRCS	Completed by Fall 2019	Initial planning of Sacramento River Watershed EA		Improve watershed health and resiliency. Reduce fire risk.	
Otero	R	Project	Watershed Restoration	Sacramento River Watershed Restoration (planning EA)	Tony McWilliams, Fuels Specialist	45,000 to 70,000 acres of planning to improve watershed.	Sacramento Ranger District	USFS, BLM, DOD, Timberon, Sunspot, Apache Point, OSWC, Otero Electric, City of Alamogordo, NM State Land Office, NM Game & Fish, NM State Forestry, NRCS	Completed by Fall 2019	Initial planning of Sacramento River Watershed EA		Improve watershed health and resiliency. Reduce fire risk.	
Otero	R	Project	Watershed Restoration	Aqua Chiquita Stream Restoration Planning and Implementation	Tony McWilliams, Fuels Specialist	Stream restoration planning, restoration, and monitoring	Sacramento Ranger District	USFS, BLM, DOD, Timberon, Sunspot, Apache Point, OSWC, Otero Electric, City of Alamogordo, NM State Land Office, NM Game & Fish, NM State Forestry, NRCS	Completed by Fall 2019	Initial planning of Sacramento River Watershed EA		Improve watershed and stream health.	
Otero	R	Project	Watershed Restoration (thinning)	Upper Rio Penasco Stream Restoration planning and Implementation	Tony McWilliams, Fuels Specialist	Stream restoration planning, restoration, and monitoring	Sacramento Ranger District	USFS, BLM, DOD, Timberon, Sunspot, Apache Point, OSWC, Otero Electric, City of Alamogordo, NM State Land Office, NM Game & Fish, NM State Forestry, NRCS	Completed by Fall 2019	Initial planning of Sacramento River Watershed EA		Improve watershed and stream health.	
Otero	R	Program	Data Collection			Hydrogeology studies completed for the Sacramento Mountains and Northeastern Tularosa Basin by the NM BGMR.		NM BGMR?				Needs: Watershed hydrologic model Long-term monitoring of existing wells-springs-streams for water quantity and water quality.	
Otero	R	Program	Planning	Fresh Water Wells	Direct communication, water planning meeting	An evaluation is needed to determine potential additional diversions for fresh water, if any.							
Otero	R	Program	Planning	Basin Water Committee/Authority	Direct communication, water planning meeting	Develop an organization to facilitate the sharing of information regarding water issues across all types of water users							
Otero	SS	Program	Data Collection	Aquifer Monitoring Program	NMED, water planning meeting	Maintain existing USGS and the City of Alamogordo monitor wells, continue monitoring from existing wells, expand monitoring program by adding additional wells.	Bureau of Geology, New Mexico Institute of Mining and Technology	USGS, NMED		Ongoing		Monitor aquifers underlying the Tularosa and Salt Basins. Existing data points should be maintained. If funding is found, additional monitoring locations should be chosen.	

Regional Water Planning Update
Projects, Programs, and Policies
Water Planning Region 5: Tularosa-Sacramento-Salt Basins

County	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
Otero	SS	Project	Water System Infrastructure (M)	Canyon Hill MDWCA Improvement Project	NMED, water planning meeting	Upgrades would be done to the distribution system including replacement of approx. 1,000 feet of old iron pipe with PVC.	Canyon Hills		To be completed within 5 years	Initial	Unknown at present	Upgrades to the existing water system would prevent leaks and decrease overall water loss.	
Otero	SS	Policy	Water Rights	Water Rights Protection	City of Alamogordo	Water rights protection by providing time extensions and proof of beneficial use.	City of Alamogordo		FY2015-16 - FY2018	Planning	$4,500	Water rights protection	
Otero	SS	Program	Planning	40 Year plan update	City of Alamogordo	Develop 40 year plan.	City of Alamogordo		FY2019-20	Planned	$15,000	Provide water planning	
Otero	SS	Project	Water System Infrastructure (M)	Utility infrastructure replacement program	City of Alamogordo	Water Distribution, fix leaking pipes	City of Alamogordo		FY2015-16/17/18/19/20	Under development	$800,000	leaking pipes	$800,000 per annum
Otero	SS	Project	Planning	Alamogordo Regional Water Supply Project	City of Alamogordo	Municipal water supply for the City of Alamogordo (4,000 afy from the Snake Tank well field for desalination).	City of Alamogordo		FY2017				
Otero	SS	Project	Data Collection	Water/Wastewater Analytical Services	City of Alamogordo	Water quality data or investigation	City of Alamogordo		ongoing				
Otero	SS	Project	ASR	Feasibility Study	City of Alamogordo	ASR: A feasibility study was completed for the City of Alamogordo. The study concluded that the La Luz well field aquifer was capable of storing and holding injected water.	City of Alamogordo		FY2017-18	Preliminary planning and design		The City is currently pursuing a full-scale ASR. Alamo Canyon & Maruchi Canyon are piped and the water is being stored for use in peak demand times.	
Otero	SS	Project	Water System Infrastructure	Desalination Facility/ Storage/Evaporation ponds	City of Alamogordo	Desalination facility and infrastructure development	City of Alamogordo		FY2017-19	PER completed, under design	$8,500,000	Increase water supply	
Otero	SS	Project	Wastewater reuse	LaVelle Reclaimed/ Potable Flush modification	City of Alamogordo	LaVelle and WRF Reclaimed/Potable Flush modification	City of Alamogordo		FY2016-17	Under development	$120,000		
Otero	SS	Project	Water System Infrastructure (M)	La Luz South Reservoir Cover Slope Replacement	City of Alamogordo	Reservoir infrastructure improvement	City of Alamogordo		FY2018-19	Under development	$1,800,000	Infrastructure repairs	
Otero	SS	Project	Water System Infrastructure (M)	Snow Smith / Fresnal Canyon watermain replacement	City of Alamogordo	Water distribution	City of Alamogordo		FY2018-19/20	Under development/ planning	$675,000	Infrastructure improvements	Project listed in FY2017-2021 Infrastructure Capital Improvement Plan (Fresno Canyon)
Otero	SS	Project	Water System Infrastructure (M)	La Luz open storage reservoir sluice gate replacement	City of Alamogordo	Reservoir infrastructure improvement	City of Alamogordo		FY2015-16	Planned	$30,000	Infrastructure repairs	
Otero	SS	Project	Water System Infrastructure (M)	Snake Tank Transmission line (Snake Tank to La Luz)	City of Alamogordo	Water distribution	City of Alamogordo		FY2015-16/17/18/19/20	Under development	$2,000,000	Increase water distribution efficiency	$2,000,000 per annum Project listed in FY2017-2021 Infrastructure Capital Improvement Plan
Otero	SS	Project	Water System Infrastructure (M)	Ground Storage Reservoir (water tank) improvements, rehabilitation, painting	City of Alamogordo	Water tank infrastructure improvements	City of Alamogordo		FY2015-16/17/18/19	Under development	$50,000	Infrastructure improvements	Initial data collection SFY16; Public Outreach and additional data collection in SFY17 and SFY18.
Otero	SS	Project	Water System Infrastructure (M)	SCADA and Zone valve realignment	City of Alamogordo	Water distribution	City of Alamogordo		FY2015-16/17/18/19	Under development	$25,000	Infrastructure improvements	$25,000 per annum
Otero	SS	Project	Water conservation	Golf Course pond relining	City of Alamogordo	Pond improvements	City of Alamogordo		FY2015-16/17/18/19	Under development	$300,000	Infrastructure improvements	State funded
Otero	SS	Project	Water System Infrastructure (M)	Dewey Lane water main and service line replacement	City of Alamogordo	Water distribution	City of Alamogordo		FY2015-16	Under development	$500,000	Infrastructure improvements	
Otero	SS	Project	Water System Infrastructure (M)	Railroad Road water main and service line replacement	City of Alamogordo	Water distribution	City of Alamogordo		FY2015-16	Under development	$500,000	Infrastructure improvements	
Otero	SS	Project	Water System Infrastructure (M)	Reclaimed pivot watermain replacement	City of Alamogordo	Water distribution	City of Alamogordo		FY2015-16	Under development	$500,000	Infrastructure improvements	
Otero	SS	Project	Water System Infrastructure (M)	Lower Heights - Alamo Canyon 14" Transmission line replacement	City of Alamogordo	Water distribution	City of Alamogordo		FY2015-16	Under development	$600,000	Infrastructure improvements	
Otero	SS	Project	Water System Infrastructure (M)	Golf Course Ground Storage Reservoir	City of Alamogordo	Build new reservoir	City of Alamogordo		FY2019-20	Under development	$2,500,000	Increase water storage capacity	
Otero	SS	Project	Water System Infrastructure (M)	18" Bonito Transmission line replacement (La Luz Plant to Hwy 82)	City of Alamogordo	Water distribution	City of Alamogordo		FY2015-16	Under development	$400,000	Infrastructure improvements	
Otero	SS	Project	Wastewater reuse	Griggs Park and University Park Reclaimed Ground Storage Reservoir	City of Alamogordo	Build new reservoir for reclaimed water	City of Alamogordo		FY2017-18	Under development	$1,800,000	Increase water storage capacity	

Regional Water Planning Update

Projects, Programs, and Policies

Water Planning Region 5: Tularosa-Sacramento-Salt Basins

County	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
Otero	SS	Project	Wastewater reuse	18th Street Reclaimed Ground Storage Reservoir	City of Alamogordo	Build new reservoir for reclaimed water	City of Alamogordo		FY2017-18/19	Under development	$1,500,000	Increase water storage capacity	
Otero	SS	Project	Planning	Wastewater Reuse Master Plan Update	Worksheet, direct communication from Brian Cesar, Public Works Director		City of Alamogordo		Jun-15				
Otero	SS	Project	Planning	O&M Bonito Lake and La Luz Reservoir	City of Alamogordo	Dam safety investigation	City of Alamogordo		Dec-16				
Otero	SS	Project	Planning	Desalination Feasibility Study and Pilot Project	City of Alamogordo		City of Alamogordo						
Otero	SS	Project	Water System Infrastructure (M)	ASR Hybrid Well No. 9	City of Alamogordo		City of Alamogordo						
Otero	SS	Project	Water system infrastructure (M)	Springer Springs Diversion Structures	City of Alamogordo		City of Alamogordo						
Otero	SS	Project	Water System Infrastructure (M)	Alamo Canyon to Foothills and Lower Heights Waterline	City of Alamogordo		City of Alamogordo						
Otero	SS	Project	Water system infrastructure (M)	Lower Heights Pump Station	City of Alamogordo		City of Alamogordo						
Otero	SS	Project	Wastewater system infrastructure (M)	Tertiary Wastewater Treatment Plant	City of Alamogordo		City of Alamogordo						
Otero	SS	Project	Wastewater system infrastructure (M)	Septage Receiving facilities	City of Alamogordo		City of Alamogordo						
Otero	SS	Project	Wastewater system infrastructure (M)	Rath Tara Estates - Alamo Canyon	City of Alamogordo		City of Alamogordo						
Otero	SS	Project	Water reuse	Reclaimed Water Line Looping Project	City of Alamogordo	Installation of approximately 6600 linear feet of 10" reclaimed water line from the existing effluent line north to tie into the existing line in the vicinity of 14th Street.	City of Alamogordo				$400,000		Grant Funding: NMED Capital Appropriation PM: Nancy Beshaler
Otero	SS	Project	Water reuse	Water Reclamation Facility Upgrade	City of Alamogordo	Improvement to the Alamogordo Water Reclamation Facility to include headworks grit chamber, new aeration basin, process equipment, electrical power and controls, new blower building, effluent reservoir, and other misc. improvements.	City of Alamogordo				$9,951,800		PM: Nancy Beshaler
Otero	SS	Project	Data Collection	Brackish Water Desalination and Monitoring	City of Alamogordo	Brackish Water Desalination: Alamogordo Desalination Project at 30%. Monitoring salinity levels in the aquifer; public outreach.	City of Alamogordo	USGS				Needs: USGS – Monitoring of salinity levels Assessing impacts of pumping and climate change on Tularosa Basin fresh and brackish water resources Public outreach to smaller communities	
Otero	SS	Project	Data collection	Salinity level monitoring	City of Alamogordo	Monitoring of salinity levels by USGS; mapping fresh and brackish water resources; assessing impacts of pumping and climate change on Basin.	City of Alamogordo	USGS		Conceptual development			
Otero	SS	Project	ASR	Alamogordo ASR	City of Alamogordo	A feasibility study was completed and concluded that the La Luz well field aquifer is capable of storing injected water.	City of Alamogordo			Feasibility study completed; pursuing a full-scale ASR program			
Otero	SS	Project	Planning	Enchanted Valley Water System	NMED, water planning meeting	Develop additional water source	Enchanted Valley Water Users Association	NMED	Not yet determined	Initial phase of planning	Not yet determined	The existing water source for this community is not sufficient for short or long term.	
Otero	SS	Project	Water System Infrastructure	Water Treatment Plant Replacement	2017-2021 ICIP Projects	Design, construct and replace the existing Water Treatment Plant which is limited in production, outdated, difficult to maintain, and safety concerns. Projected population and density increases beyond the 2017-2021 planning period will impact water demand. Phase one will involve the acquisition of two/thirds acre or more of land for raw water storage. Phase two will involve the design (Engr./Arch.) of new Water Treatment Plant and Phase 3 will involve the construction and start-up of the new Water Treatment Plant. LLMDWCA currently has one recommended funding source through NMFA (CIB) for design of water treatment plant. As of this date, the PER is complete and Recommended Alternative 3 - Gravity Filtration System has been selected.	La Luz Mutual Domestic Water Consumers Association				$1,468,707		

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County	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
Otero	SS	Project	Water System Infrastructure	Waterline Replacement, Appurtenances and SCADA System	2017-2021 ICIP Projects	LLMDWCA currently have one committed funding source through NMFA (CIB), part one of Phase 4, design of water lines. We also have one recommended funding source through NMFA (CIB), part two of Phase 4, design of waterlines and one recommended funding source through NMFA (CIB)part one of phase 4, construction of waterlines. This project includes replacement of approximately 5 miles of deficient waterlines with 8 and 6-inch water mains, including appurtenances and a SCADA system. The existing waterlines proposed for replacement were installed in the 1970s, and are passed their serviceable life. The waterlines scheduled for replacement are small diameter lines providing minimal water pressure during peak hours, and marginal fire protection. Phase 1 will involve acquisition of Easements and Right of Ways. Phase 2 will involve Design of new water lines, appurtenances, and SCADA system. Phase 3 will involve construction (installation) of new water lines, appurtenances, and SCADA system. The PER is complete with Alternative 2, Replacement of existing waterlines being selected. This will include 4,100 feet of 8 inch PVC C-900 and 21,900 feet of 6" PVC C-900 waterlines.	La Luz Mutual Domestic Water Consumers Association				$2,152,260		
Otero	SS	Project	Water System Infrastructure	Redrill Well T-1056	2017-2021 ICIP Projects	Plan, design, construct and equip the redrilling of Well no. T-1056 on a parcel of land that is owned by LLMDWCA, where this well is located, to a depth of 700 feet to help meet demand and prevent a water outage. Work to be performed will be drilling, deepening pump setting depth. Custom planning and design will be afforded to this existing equipped well. Pump setting will be lowered and equipped with a new pump, motor, discharge pipe, check valves, air line, and wiring, as well as a new control box and pitless adapter. Phase 1 will involve planning and design of Well T-1056 to a depth of 700 feet. Phase 2 will involve the construction (redrilling), installation of new equipment for Well T-1056.	La Luz Mutual Domestic Water Consumers Association				$20,000		
Otero	SS	Project	Data Collection	USGS Hydrologic Study	La Luz Mutual Domestic Water Consumers Association	Hydrogeologic study, well levels checked monthly	La Luz Mutual Domestic Water Consumers Association & Mutual Sewage Works Association	USGS	Jul-14				
Otero	SS	Program	Planning	40 Year plan update	La Luz Mutual Domestic Water Consumers Association	Survey complete Jan. 2000 to Livingston Associates for Tularosa Basin & Salt Basin Regional Water	La Luz Mutual Domestic Water Consumers Association & Sewage Works Association		Jan-00	Survey completed		Planning	
Otero	SS	Program	Planning	Water and Sewer Master Plan	La Luz Mutual Domestic Water Consumers Association	Completed water master plan	La Luz Mutual Domestic Water Consumers Association & Sewage Works Association		Apr-15	Water plan complete, not Sewer Master Plan		Planning	
Otero	SS	Project	Data Collection	NMED Regulatory Monitoring	La Luz Mutual Domestic Water Consumers Association	Surface water monitoring, NMED	La Luz Mutual Domestic Water Consumers Association & Sewage Works Association	NMED				Ongoing monitoring	
Otero	SS	Project	Data Collection	Annual CCR, NMED Regulatory Monitoring	La Luz Mutual Domestic Water Consumers Association	Water quality monitoring	La Luz Mutual Domestic Water Consumers Association & Sewage Works Association	NMED				Ongoing monitoring	
Otero	SS	Project	Water System Infrastructure	Water System & Production Facility PER	La Luz Mutual Domestic Water Consumers Association	Beginning planning to implement Preliminary Engineering Report completed in April 2015	La Luz Mutual Domestic Water Consumers Association & Sewage Works Association		FY17	Initial planning completed. Need to find funds for implementation		PER for water system and production facility.	
Otero	SS	Project	Water reuse	Cloudcroft Direct Potable Reuse (DPR) Regulation Development	NMED, water planning meeting	Development of guidelines by the NMED for pretreatment plans, water system capacity, training, monitoring, process control, sampling, operation & maintenance and regulation of DPR on a statewide level.	NMED Drinking Water Bureau	NMED Construction Programs Bureau, Surface Water Bureau, Groundwater Bureau, Environmental Health Bureau and OSE	FY 2015	In process		First DPR facility in NM to provide potable water is nearing completion. Future needs will entail development of guidelines by the NMED	Policy development for DPR in process by NMED; expected to publish guidelines by 10-2015.
Otero	SS	Project	Water System Infrastructure (M)	Orogrande Public Water System Improvements	NMED, water planning meeting	Replace two booster pumps, miscellaneous water system improvements for water delivery and inventory of spare parts.	Orogrande Water System	NMED Drinking Water Bureau, NMED Construction Programs Bureau	2015 - 2020	Initial phase of planning, completion within 5 years	Not yet determined	The Orogrande water system is needing replacement of two booster pumps to deliver water to their main storage tank. Additionally they need miscellaneous water system improvements for the safe delivery of water within distribution and at the point of connection with Lake Section Water Company.	

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Otero	SS	Project	Flood Control	Dog Canyon Flood Control Structure	Capital Outlay	LiDaR Study with mapping	Otero County		FY2016	Preliminary	$175,000	Continued flooding issues from Alamo Canyon South beyond Dog Canyon and West though Boles Acres	State funded
Otero	SS	Project	Water system infrastructure	Watershed Rehabilitation/Restoration - Reducing the sedimentation/siltation with the Upper Rio Penasco	Otero SWCD	Install grade control structures, erosion control structure, headcut stabilization structures, and hardened water lanes.	Otero Soil Water Conservation District	USFS, SCM RC&D			$198,320	Assist in reversing erosion process and initiating sediment deposition, water harvesting, nutrient retention, revegetation, and bank stabilization.	
Otero	SS	Project	Water conservation	Laser Leveling	Worksheet, direct communication from Carol Ruiz, Lead Program Technician	Laser leveling for agricultural field irrigation	Otero-Lincoln Farm Service Agency	Natural Resources Conservation Service, Local Soil & Water District Offices	Unknown	Not under development yet	Unknown	Minimize excess tailwater and water pooling	
Otero	SS	Project	Water System Infrastructure (A)	Lining Ditches with Concrete	Worksheet, direct communication from Carol Ruiz, Lead Program Technician	Concrete line existing ditches for agriculture-water conveyance	Otero-Lincoln Farm Service Agency	Natural Resources Conservation Service, Local Soil & Water District Offices	Unknown	Not under development yet		Reduce leakage and improve conveyance efficiency	
Otero	SS	Project	Water System Infrastructure (A)	Pressurized Sprinklers and Drip Irrigation Systems	Worksheet, direct communication from Carol Ruiz, Lead Program Technician	Install and use pressurized sprinklers and drip irrigation systems.	Otero-Lincoln Farm Service Agency	Natural Resources Conservation Service, Local Soil & Water District Offices	Unknown	Not under development yet		minimize tailwater loss, deep percolation	
Otero	SS	Project	Water System Infrastructure (A)	Metering of Agricultural Water	Worksheet, direct communication from Carol Ruiz, Lead Program Technician	Metering of water in streams and wells	Otero-Lincoln Farm Service Agency	Natural Resources Conservation Service, Local Soil & Water District Offices	FY2015	Not under development yet		Allows water user to apply water precisely to meet the needs of the crop with minimum waste.	
Otero	SS	Project	Water System Infrastructure	Rolling Hills MDWCA Improvement Project	NMED, water planning meeting	System is in need of distribution system upgrade to prevent leaks and decrease system water loss.	Rolling Hills Water System		Within 5 years to complete	Initial planning phase		Failing infrastructure	
Otero	SS	Project	Water System Improvements	Timberon WSD Water System Improvements	Capital Outlay		Timberon		FY2016		$100,000		State funded
Otero	SS	Project	Water System Infrastructure	Timberon WSD Well Improvements	Capital Outlay		Timberon		FY2016		$28,000		State funded
Lincoln	SS	Project	Water and Wastewater system infrastructure and Planning (M)	Water System Upgrades, Wastewater Upgrade, and 40-year Plan	Worksheet, direct communication from Leann Weihbrecht, Clerk/Treasurer	Projects include water line replacement, drilling of a new well, upgrades to filter plant when surface water is restored from Bonito Lake, extension of water lines, replace meters with digital read meters and software to go with the digital read meters, upgrade existing wells, 40 year water plan, replace liner in one lagoon at wastewater treatment plant.	Town of Carrizozo	Livingston Associates (Water Filtration Plant)				Provide for needed upgrades and water planning.	
Lincoln	SS	Project	Water System Infrastructure	Well & Well Houses	2017-2021 ICIP Proj	To plan, design, purchase and construct a new well, new well houses, tear down old well houses, install 288 LF of fence around well houses and water storage tanks, and purchase a 60 KW back-up generator. The current wells are too close together and draft off of each other. The well heads need rehabilitation. The Town is unable to run both of the current wells at the same time without tripping the breakers. A back-up generator is needed. New fencing is needed to meet homeland security requirements. Well houses are dilapidated and need replacing. Phase 1 of this project will tear down existing well houses, construct new well houses, purchase back-up generator, fence new well houses and water storage tanks. Phase 2 is to drill a new well.	Town of Carrizozo				$580,000		
Lincoln	SS	Project	Planning	40 year water plan	2017-2021 ICIP Projects		Town of Carrizozo				$50,000		
Lincoln	SS	Project	Water System Infrastructure	Regional Bulk Water Delivery Facility	2017-2021 ICIP Projects		Town of Carrizozo				$250,000		
Otero	SS	Project	Water System Infrastructure (M)	Springs Rehabilitation	Village of Cloudcroft		Village of Cloudcroft	Livingston Associates					
Otero	SS	Project	Wastewater system infrastructure	Wastewater Treatment Plant Rehabilitation	Village of Cloudcroft		Village of Cloudcroft	Livingston Associates					Project listed in FY2017-2021 Infrastructure Capital Improvement Plan
Otero	SS	Project	Water System Infrastructure (M)	Direct Potable Water Reuse	Village of Cloudcroft	Reclaimed Water Reuse under construction in Cloudcroft	Village of Cloudcroft		2015	Expected completion 11-2015		Need: More storage for reclaimed water	

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Otero	SS	Project	Water System Infrastructure	New Water Well	2017-2021 ICIP Projects	Plan, design, construct, and equip and drill and install well casing to a depth of 1,000 feet, install submersible pump, complete installation of electrical lines and water transmission line to water storage facility. Complete archaeological, environmental, and hydrological studies. Phase 1 will complete design, engineering, land acquisition, rights-of-way, archaeological, environmental, and hydrological studies. Phase 2 will be excavating and installation of pipeline, pumps, electrical and SCADA monitoring equipment. Equipment/pipelines/valves/connections to be determined as result of engineer plan and design.	Village of Cloudcroft				$1,610,000		
Otero	SS	Project	Water System Infrastructure	Wastewater and Water Line Replacement	2017-2021 ICIP Projects	The project will eliminate aging water and wastewater infrastructure and improve service and reliability of services to approximately 350 residences.	Village of Cloudcroft				$2,685,000		
Otero	SS	Project	Wastewater System Infrastructure	Tularosa Wastewater Plant Improvements & SCADA System	Capital Outlay		Village of Tularosa		FY2016		$75,000		State funded
Otero	SS	Project	Water System Infrastructure	Tularosa Water System Improvements	Capital Outlay		Village of Tularosa		FY2016		$75,000		State funded
Otero	SS	Project	Water System Infrastructure	Water System Improvements	2017-2021 ICIP Projects	To make improvements to the items related to the water plant such as the desilting basin (sandbox) raw water intake structure, UV systems relocation and update, and tank site control repairs and upgrades waterlines valves and fire hydrants.	Village of Tularosa				1,837,897		
Otero	SS	Project	Water System Infrastructure (M)	Tularosa Creek Reservoir Water Diversion Storage System	Water planning meeting	Tularosa Creek Reservoir: The Village of Tularosa and Tularosa Community Ditch Corporation are planning a cooperative effort to divert the unused Tularosa creek water into a pipeline for transport to a reservoir and stored for later use.	Village of Tularosa Tularosa Community Ditch Corporation					Still in planning stages	
Otero	SS	Project	Water System Infrastructure (M)	Municipal/Industrial Water Conservation	NMED, water planning meeting	Infrastructure improvements, water audits		Timberon MDWCA Enchanted Valley MDWCA Oro Grande MDWCA				Needs: MDWCAs- infrastructure improvements to reduce water loss and provide alternate water sources. Timberon distribution system needs replacement ($36,000,000). Enchanted Valley (west of La Luz) needs additional water. Water audits to determine water loss and ability to correct it. Orogrande MDWCA public water system improvements for 26 mile pipeline along US 54; cleaning tanks, erosion control, water system security, updating SCADA	
Otero	SS	Project	Water System Infrastructure (A)	Irrigated Agriculture Water Conservation	Water Planning meeting	Middle and North Fork ditch pipeline maintenance or replacement						Middle and North Fork Fresnal Acequias Agriculture: 6 miles of ditch pipelines installed in 1959 & 1960 need replacement (1.75 million), springs need renovation and 4000 feet of ditch need cleaning. *Middle and North Fork Fresnal Acequias Domestic: water conveyance systems are needed, but the Middle Fork would like to stay an open ditch.	