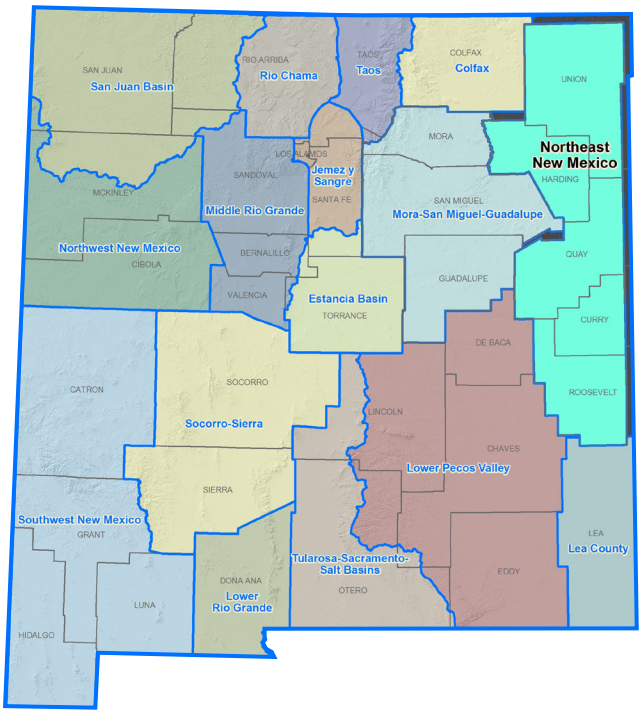
Northeast New Mexico Regional Water Plan



September 2016

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

Cover photograph: Ute Dam

Table of Contents

List of Figures

List of Tables

List of Appendices

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
BNSF	Burlington Northern Santa Fe
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CID	Carlsbad Irrigation District
CWA	Clean Water Act
DBS&A	Daniel B. Stephens & Associates, Inc.
DWS	Domestic Well Statute
ENMRWS	Eastern New Mexico Rural Water Supply
ENMWUA	Eastern New Mexico Water Utility Authority
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
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
in/yr	inches per year
IPCC	Intergovernmental Panel on Climate Change
JPA	joint powers agreement
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
MDWUA	mutual domestic water users association
NASS	National Agricultural Statistics Service
NCDC	National Climatic Data Center
NEPA	National Environmental Policy Act

NMAC	New Mexico Administrative Code
NMBGMR	New Mexico Bureau of Geology & Mineral Resources
NMED	New Mexico Environment Department
NMG&F	New Mexico Department of Game and Fish
NMISC	New Mexico Interstate Stream Commission
NMOSE	New Mexico Office of the State Engineer
NMSA	New Mexico Statutes Annotated
NMSU	New Mexico State University
NMWQCC	New Mexico Water Quality Control Commission
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRCS	Natural Resources Conservation Service
NWS	National Weather Service
PCE	tetrachloroethylene
PDO	Pacific decadal oscillation
PDSI	Palmer Drought Severity Index
PPP	project, program, and policy
PVACD	Pecos Valley Artesian Conservancy District
RWP	regional water plan
SDWA	Safe Drinking Water Act
SNOTEL	snowpack telemetry
SWCD	soil and water conservation district
TQCRWA	Tucumcari Quay County Regional Water Authority
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
WQA	Water Quality Act (New Mexico)
WRCC	Western Regional Climate Center

Executive Summary

The Northeast New Mexico Water Planning Region, which includes Union, Harding, Quay, Curry, and Roosevelt 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 Northeast New Mexico Regional Water Plan was completed and accepted by the NMISC in 2007.

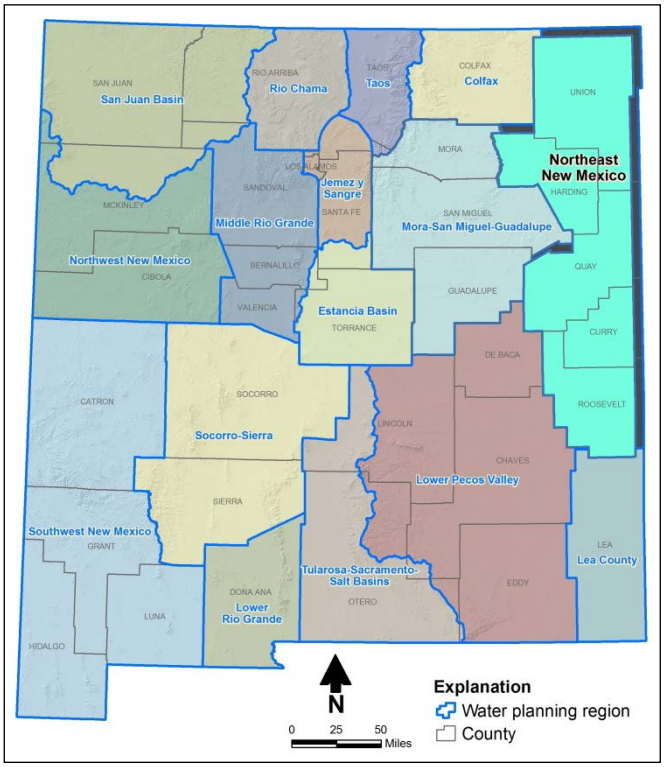


Figure ES-1. Northeast New Mexico Water Planning Region

The purpose of this document is to provide new and changed information related to water planning in the Northeast New Mexico 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 2007 plan and provides updated information regarding changed conditions and additional data that have become available.

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 for the underground water basins (UWBs) in the region. 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. Future water demand projections do not reflect substantial growth in water use, due to the declining economy. However, even without significant growth in demand, supply shortages are predicted because of the region's reliance on groundwater basins with declining supplies. Although surface water supplies only approximately 13 percent of the water currently diverted in the Northeast New Mexico Water Planning Region, a prolonged extreme drought could impact the surface water supplies. The

estimated shortage in 2060 due to a prolonged drought is expected to range from 471,395 to 416,921 acre-feet.

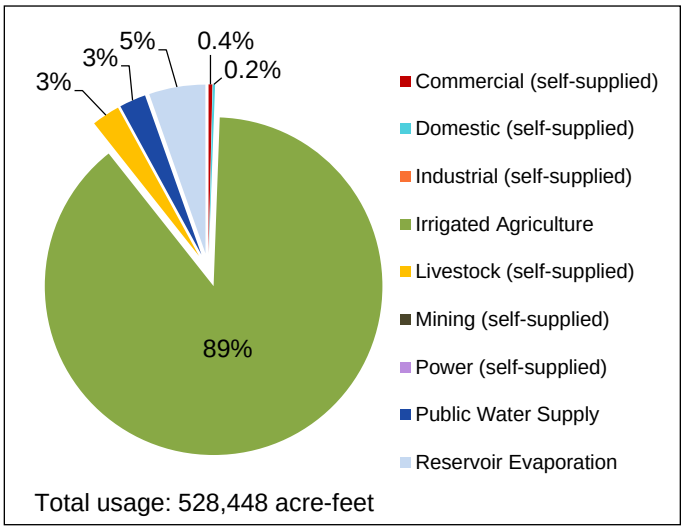


Figure ES-2. Total Regional Water Demand, 2010

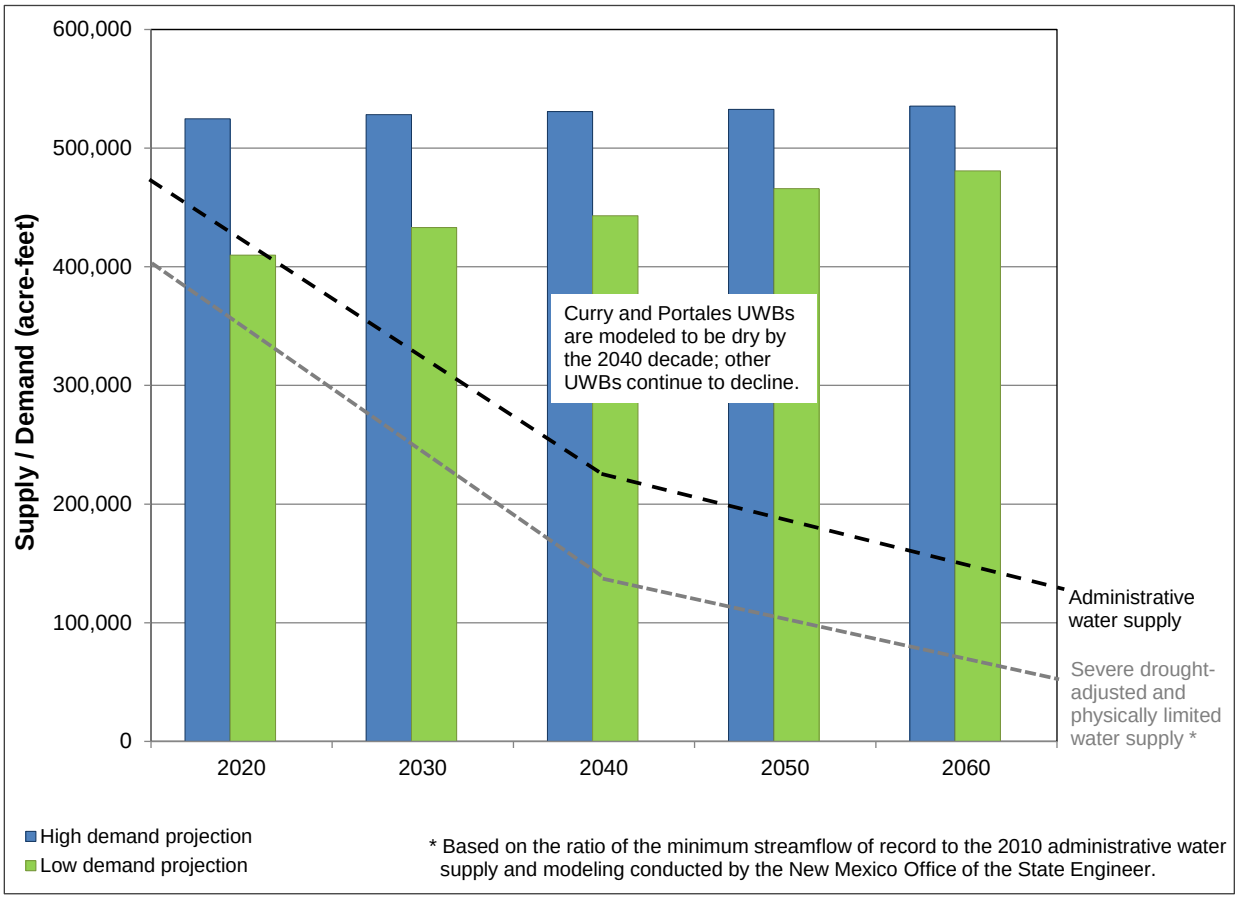


Figure ES-3. Available Supply and Projected Demand

To address the gap between water supply and projected demand, the Northeast New Mexico regional water planning group has put together a comprehensive list of projects, programs, and policies. In addition to water system infrastructure and watershed management projects, these include regional aquifer mapping projects to better understand the volume of groundwater in storage and recharge rates, creation of critical conservation areas for the remaining Ogallala aquifer, water reuse projects using all sources of treated water for various uses, and creation of agricultural land trusts to issue conservation easements, tax credits, and mitigation banking as means to conserve water.

Planning Method

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

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

Common Technical Approach

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

Public Involvement

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

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

Over the two-year update process, eight meetings were held in the Northeast New Mexico 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 Northeast New Mexico region include the following:

- The Curry and Portales Underground Water Basins have been closed to new appropriations. This area has a very limited saturated thickness and relatively high rates of water level decline. The life expectancy of the groundwater supply in the Portales and Clovis areas is predicted to be less than 13 and 20 years, respectively, according to analysis using groundwater models (Section 7). New sources of groundwater supply have not been identified. A number of communities in the Curry and Portales basins plan on using the Eastern New Mexico Rural Water System project (ENMRWS) as an alternate supply when the High Plains Aquifer is no longer a viable source of water. The groundwater basins, along with conservation measures and reuse projects, will remain a backup source in times of drought. Water levels in these basins are also affected by groundwater pumping in Texas.

- For the climate divisions within the planning region (New Mexico Climate Divisions 2 and 3), 2011, 2012, and 2013 were all severe to extreme drought years, and the winter snowpack for 2014 was also very low. As of January 2014, agricultural irrigators in all

five counties in the planning region (along with 22 other New Mexico counties) were eligible for emergency drought assistance through the farm service agency. As of May 2015, Union, Harding, and Quay counties were designated as primary counties for 2015 crop disaster losses. Curry and Roosevelt counties were also eligible for drought assistance, since they were designated as contiguous counties.

- The region must ensure continued compliance with the terms of the Canadian River Compact, ratified in 1951, as well as the 1993 Supreme Court Decree in *Oklahoma and Texas v New Mexico*, which allow New Mexico free and unrestricted use of all waters originating in the drainage basin of the Canadian River above Conchas Dam and free and unrestricted use of water originating below the dam, with the amount of water that may be stored or impounded limited to an aggregate of 200,000 acre-feet of conservation storage.

- Quay County and the local governments of Tucumcari, Logan, and San Jon entered into a joint powers agreement in January 2012 to establish the Tucumcari Quay County Regional Water Authority (TQCRWA) to address water planning in Quay County. The TQCRWA is working on developing a project separate from the ENMRWS project that would deliver the Ute Reservoir allocation for these member communities within Quay County.

- The TQCRWA has entered into a contractual arrangement with Brookfield Properties for installation of an intake structure on the south side of Ute Reservoir. A temporary interim intake structure has already been built on the south side of the reservoir and is being used to provide water for the golf course at Ute Lake Ranch subdivision. Regarding a permanent south side intake structure, by motion on August 31, 2011, the NMISC took the position that once operational the Eastern New Mexico Water Utility Authority (ENMWUA) intake structure will be the only intake structure at the reservoir, with access to the already built interim intake as a backup supply only. The TQCRWA would like to install an intake structure and treatment plant on the south side of Ute Reservoir to provide Quay County users with surface water for municipal and industrial use rather than using the ENMWUA intake and treatment facilities.

- Groundwater levels continue to decline in the Ogallala aquifer, and the ENMWUA is in the process of constructing the Eastern New Mexico Rural Water System to provide surface water from Ute Reservoir to Curry and Roosevelt counties and communities within them for municipal and industrial use. However, the pipeline will not provide water for irrigation, which is the main water use in the region. The project's current focus is on an interim pipeline to serve Clovis, Cannon AFB, Portales, and other customers.

- In order to extend the City’s water supply before the ENMWUA project comes online, the City of Clovis is in the process of implementing a wastewater reuse project, plans to

install six wells and lease the water to EPCOR Water (the private water supplier), is buying water rights adjacent to Cannon Air Force Base, and is creating a special conservation district where irrigation will be retired to slow the groundwater level declines.

- EPCOR Water has a comprehensive water conservation program, which includes increasing block rates, public outreach, residential and non-residential rebates, and water conservation audit and retrofit kit giveaways. EPCOR Water also has a water leasing program, where they work with farmers to shift water use from agricultural to municipal use. Under the leasing program, well owners are responsible for the wells meeting potable water supply standards, and EPCOR Water runs the necessary transmission lines to connect the wells to the system. EPCOR Water then operates the leased wells and buys wet water from the owners. This program will be expanded in the future.

- Portales has completed a number of studies evaluating possible sources for municipal supply. To extend the City's water supply before the ENMWUA supply comes online, the City is implementing wastewater reuse and more stringent conservation measures, and has purchased land and water rights, retiring agricultural production to create a groundwater reserve. The City is also evaluating aquifer storage and recovery projects using treated wastewater.

- Given the region's current heavy reliance on groundwater, water quality in the High Plains and other aquifers is of utmost importance. Potential threats to groundwater quality that were identified in the original plan include leaking underground storage tanks, septic systems, agricultural activity and dairy operations, sewage treatment plants, and petroleum, methane, and total dissolved solids contamination from oil and gas field operations. In addition, surface water quality concerns were identified for playa lakes, which are the primary source of recharge for the High Plains aquifer.

- The potential impacts of septic tanks to water quality, especially along the shores of Ute Reservoir, are of particular concern. The Village of Logan completed a $15 million wastewater and sewer extension project in January 2010 to connect all homes and business located on the north side of Ute Reservoir and all state park restrooms and rest stations to the sewer system; the resulting decreased reliance on septic systems is expected to improve water quality in and around the lake.

- There are 63 small public water systems in the region. Though the source water for these systems is generally of good quality, the maintenance, upgrades, training, operation, and monitoring that is required to ensure delivery of water that meets drinking water quality standards can be a financial and logistical challenge for many of these systems.

- The New Mexico Environment Department (NMED) periodically tests fish in New Mexico lakes and reservoirs for mercury, which in the form of methylmercury can be very toxic over long periods of exposure at low levels. Due to mercury detected in some fish at concentrations that could lead to significant adverse human health effects, fish consumption advisories have been issued for Clayton Lake and Ute Reservoir. The source of the mercury is most likely atmospheric deposition.

- Concentrations of nitrogen, phosphorus, suspended solids, and salt may increase in the future in response to increased surface water evaporation rates and increased precipitation intensity. Intense storms wash a greater volume of pollutants into rivers, which in recent years have had a decreased overall flow volume with which to dilute the concentrations of contaminants. In addition, higher water temperatures can lead to less dissolved oxygen, which is a problem for many aquatic species.

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 2007 Northeast New Mexico Regional Water Plan recommended the following strategies for meeting future water demand:

- Municipal conservation
- Agricultural conservation
- Groundwater management
- Rangeland conservation and watershed management
- Water rights protection
- Eastern New Mexico Rural Water System
- Infrastructure upgrades
- Planning for growth
- Dam construction

The steering committee reviewed each of the strategies and indicated that except for the dam construction strategy that called for evaluating the possibility of a new impoundment in Harding County, these strategies are still relevant, though the updated list of strategies is much more focused on the project, program, and policy sponsors.

During the two-year update process the Northeast New Mexico Steering Committee and stakeholders identified projects, programs, and policies (PPPs) to address their water issues. Some water projects were identified through the State of New Mexico Infrastructure Capital Improvement Plan, Water Trust Board, Capital Outlay, and NMED funding processes; however, projects were added to the comprehensive table of PPP needs only at the request of the project sponsors (i.e., projects were not automatically added to the PPP table). 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 Northeast New Mexico region, projects identified on the PPP table are primarily water system infrastructure and water conservation projects (groundwater sustainability is a major concern in Northeast New Mexico).

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 Northeast New Mexico region stakeholders:

- Canadian River Riparian Restoration Project
- Regional aquifer mapping projects
- Tucumcari Quay County Regional Water Authority (TQCRWA) project. (See the previous discussion of this project on page ES-5.)
- Eastern New Mexico Rural Water System project
- Llano Estacado water conservation initiative (creating a critical conservation area west of Clovis to preserve the remaining Ogallala aquifer)
- Arch Hurley Conservancy District agricultural conservation projects
- Development of viable dryland crops
- Water reuse projects using all sources of treated water (municipal wastewater, dairy and cheese plant wastewater, and produced water) for various uses, including irrigation, potable use, industrial use, aquifer storage and recovery, and power generation
- Creation of agricultural land trusts
- Playa lake restoration projects

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 Northeast New Mexico Water Planning Region, which includes all of Union, Harding, Quay, Curry, and Roosevelt 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 *Northeast New Mexico Regional Water Plan* was completed and accepted by NMISC in March 2007 (DBS&A, 2007).

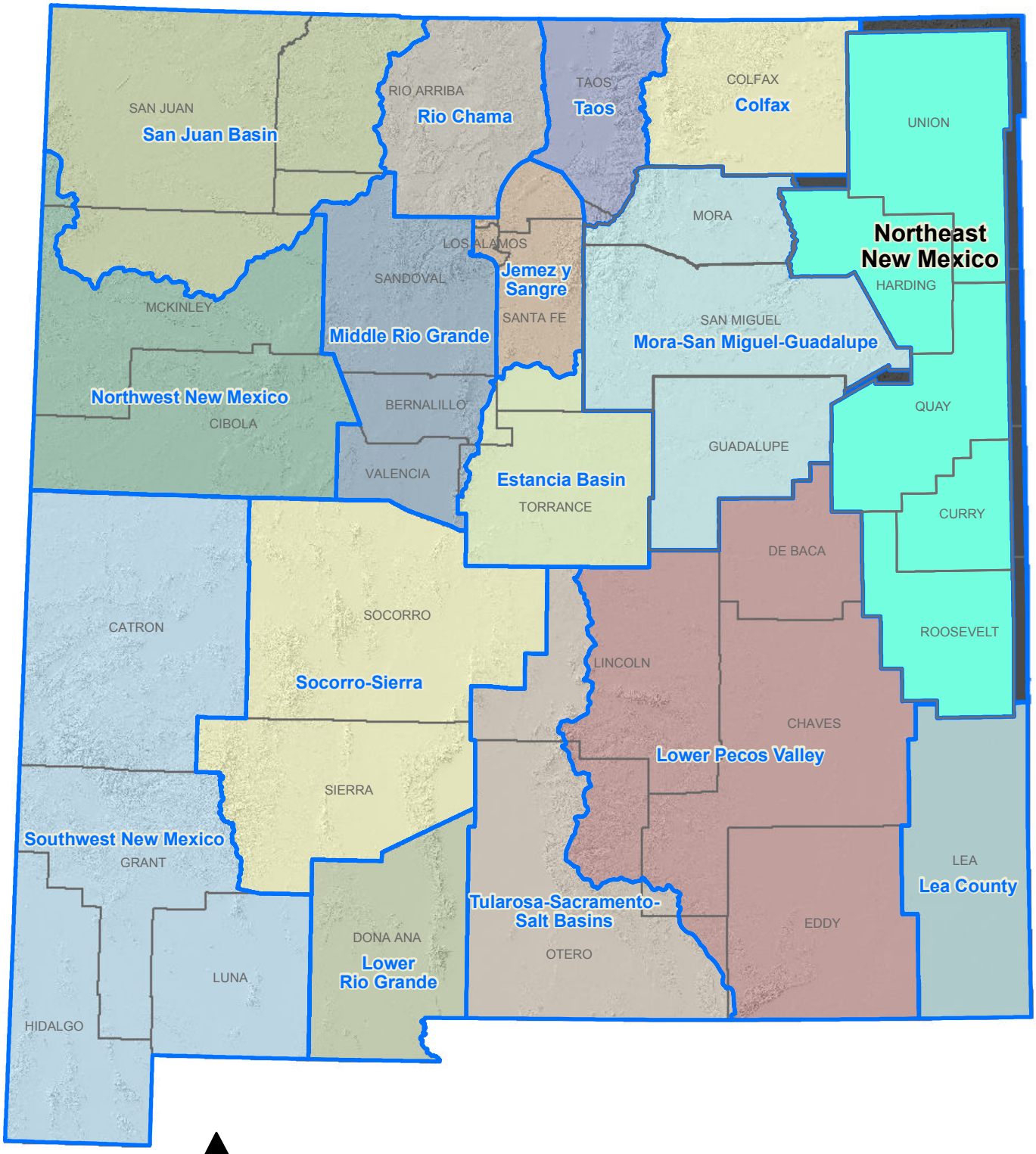
The purpose of this document is to provide new and changed information related to water planning in the Northeast New Mexico region, as listed in the bullets below, and to evaluate projections of future water supply and demand for the region using a common technical approach applied to all 16 planning regions statewide. Accordingly, the following sections summarize key information in the 2007 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 Northeast New Mexico 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 Northeast New Mexico 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.

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

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



NORTHEAST NEW MEXICO
REGIONAL WATER PLAN 2016

Location of Northeast New Mexico Water Planning Region

Figure 1-1

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- Section 3 provides background information regarding the characteristics of the Northeast New Mexico 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 2007 RWP; key information from that plan is summarized in Section 5, with new information that has become available since 2007 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 2007 RWP. Section 6 provides updated population and water use data, which are then used to develop updated projections of future water demand.

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

Common Technical Approach

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

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

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

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

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

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

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

2. Public Involvement in the Planning Process

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

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

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

- Setting up and facilitating meetings to carry out the regional water plan update process.

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

This approach represents a change in the State's role from the initial round of regional water planning, beginning in 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 Northeast New Mexico 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 the 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 *Northeast New Mexico 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 Northeast New Mexico 2016 regional water plan.

2.2 Public Involvement in the Northeast New Mexico 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 Northeast New Mexico Water Planning Region established a representative steering committee, the members of which are listed in Table 2-1.

The Northeast New Mexico steering committee includes several state 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 projects. The steering committee identified Sharon King, as chair, and Richard Primrose as vice-chair. No subcommittees were formed as a part of the Northeast New Mexico regional water plan update process.

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.

Table 2-1. Steering Committee Members, Northeast New Mexico Water Planning Region

Page 1 of 2

Water User Group	Name	Organization / Representation
Agricultural – groundwater user	Kenneth Davis	Curry County Farm Bureau
	Hoyt Pattison	Curry County Farm Bureau
Agricultural – surface water user	Franklin McCasland	Arch Hurley Conservancy District
County government	Justin Bennett	Union County and the Northeastern Soil and Water Conservation District (SWCD)
	Joe Culbertson, Jr.	Harding County
	Mike Cherry	Quay County
	Richard Primrose	Quay County
	Doug Reid	Curry County
	Blake Prather	Curry County
Environmental interest	Glenn Briscoe	
Extractive industry	Vacant	
Federal agency (technical support to the region)	Vacant	
State agency (technical support to the region)	Deena Kinman	Border SWCD/Roosevelt County Farm Bureau
	Erik Nelson	New Mexico State Land Office/Central Curry SWCD
	Raymond Mondragon	Eastern Plains Council of Governments (EPCOG)
	Patrick Pachta	Border SWCD
	Danny Powell	New Mexico Ground Water Association and BP Pump, Ltd.
	Tom Sidwell	Southwest Quay SWCD
State agency (technical support to the region) (Observer)	Johnna Bruhn	New Mexico Department of Agriculture
Local (retail) business	Jake Lenderking	EPCOR Water
Municipal government	Ferron Lucero	Town of Clayton
	Jack Chosvig	Town of Clayton
	Jared Langenegger	City of Tucumcari
	Robert Lumpkin	City of Tucumcari
	Wade Lane	Village of San Jon
	Larry Wallin	Village of Logan
	Chris Bryant	City of Clovis
	Claire Burroughes	City of Clovis

Table 2-1. Steering Committee Members, Northeast New Mexico Water Planning Region

Page 2 of 2

Water User Group	Name	Organization / Representation
Municipal government	Wesley Shafer	Village of Grady
	Sharon King	City of Portales
	Durward Dixon	Town of Elida
Other groups as identified by the steering committee	Justin Howalt	Eastern New Mexico Water Utility Authority (ENMWUA)
	Gayla Brumfield	ENMWUA
	Leonard Lauriault	New Mexico State University (NMSU) Agricultural Science Center, Tucumcari
	Scott Smart	Eastern New Mexico University (ENMU)
	Kendell Buzard	Roosevelt County Farm Bureau
	Pat Woods	State Senator
Other groups as identified by the steering committee (Observer)	Barbara Crockett	CH2M HILL
	Randy Crowder	State Representative
	Caleb Chandler	New Mexico Interstate Stream Commission
	Tim Farmer	District VII Manager, New Mexico Office of the State Engineer (NMOSE) (Cimarron, New Mexico)
	Andy Morley	District II Manager, NMOSE (Roswell, New Mexico)
	Steve Acheampong	Tucumcari Basin Manager, NMOSE
	Vacant	Clayton Basin Manager, NMOSE
	Mike Barajas	Curry County and Causey Lingo Basin Manager, NMOSE
Rural water provider	Phillip Box	President of the RAD Rural Water Coop in Quay County
Tribal (as applicable)	NA	NA
Watershed interest	Jack Chatfield	Canadian River Riparian Restoration Project

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

- Tucumcari Convention Center, Tucumcari, New Mexico
- Mondays at 1:30 p.m.
- Steering committee members will continue to assist with outreach.

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

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

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

- In the Northeast New Mexico region, all communications will continue to be sent out to the entire stakeholder group, and anyone that signs in at a meeting will be added to this list.
- The NMISC developed a press release announcing the Fiscal Year 2016 regional water planning activities (including meeting dates), availability of the draft Northeast New Mexico plan sections for review, and the process for submitting comments. This press release was e-mailed to the full stakeholder group, posted on County web and Facebook pages, and sent to area radio stations.
- Social media outreach was seen as a way to potentially interest younger participants in the water planning process.

3. Description of the Planning Region

This section provides a general overview of the Northeast New Mexico Water Planning Region. Detailed information, including maps illustrating the land use and general features of the region, was provided in the 2007 RWP; that information is briefly summarized and updated as appropriate here. Additional detail on the climate, water resources, and demographics of the region is provided in Sections 5 and 6.

3.1 General Description of the Planning Region

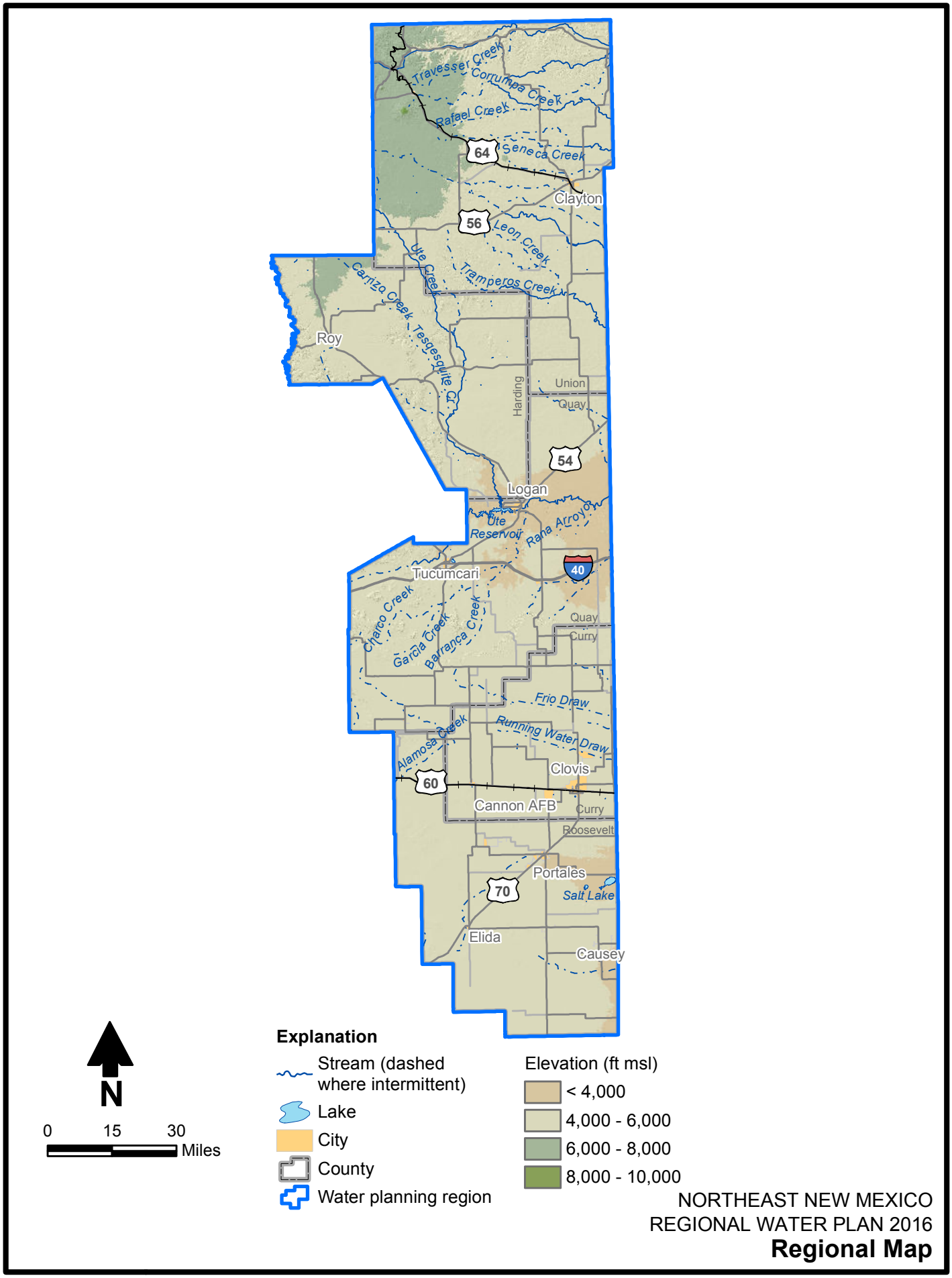
The Northeast New Mexico Water Planning Region is located in eastern New Mexico. The region is bounded on the north by Colorado, on the west by Colfax, Mora, San Miguel, Guadalupe, De Baca, and Chaves counties, on the south by Lea County, and on the east by Oklahoma and Texas (Figure 3-1). The total area of the planning region is approximately 12,697 square miles, distributed among the five counties as follows:

Table 2-2. Northeast New Mexico Region Public Meetings

Date	Location	Purpose	Meeting Summary
FY 2014			
July 21, 2014	Tucumcari Convention Center, Tucumcari, New Mexico	Kickoff meeting: Present the regional water planning update process to the region and continue to conduct outreach to begin building the steering committee.	Representatives from many of the water user groups attended the meeting and were instrumental in identifying other individuals as potential representatives for a particular group. Many of the meeting attendees were not on the master stakeholder list, and those individuals were added to the list.
FY 2015			
October 20, 2014	Tucumcari Convention Center, Tucumcari, New Mexico	Present the technical data compiled and synthesized for the region.	Data presented included population and economic trends through a series of tables, the administrative water supply, the projected future water demand, and the gap between supply and demand for both normal and drought years. In addition, the presentation reaffirmed the development of a steering committee to guide the process as outlined in the Handbook.
February 16, 2015	Tucumcari Convention Center, Tucumcari, New Mexico	Review the update process and the timeline for completing the regional water plan (RWP) update.	The group discussed new information from the region and/or the projects, policies, programs (PPPs) that had been implemented since the 2007 plan. The steering committee membership and leadership were revisited. The group further discussed where future meetings would be held and the time that would be most effective in getting the best attendance. A date was set for the next meeting and a summary of the discussion was sent to the master stakeholder list with information about the next meeting including agenda items and location, date, and time and next steps.

Table 2-2. Northeast New Mexico Region Public Meetings

Date	Location	Purpose	Meeting Summary
April 20, 2015	Tucumcari Convention Center, Tucumcari, New Mexico	Review projects completed since submission of the accepted plan and provide additional input.	The group reviewed projects completed since submission of the accepted plan and provided additional input, and discussed the goals of the updated regional water plan. The process for developing the list of future projects was discussed, and the group discussed and revised the initial list of PPPs.
June 22, 2015	Tucumcari Convention Center, Tucumcari, New Mexico	Discuss elements that would be included in the public involvement chapter and ideas for FY 2015-2016 outreach. Review and discuss future project checklist discussed at previous meeting and sent to stakeholders.	The group discussed the current fiscal year deliverables, as well as the meeting schedule and objectives for the next fiscal year. The group discussed the initial list of PPPs, and made revisions and additions.
FY 2016			
February 29, 2016	Tucumcari Convention Center, Tucumcari, New Mexico	Review steering committee membership and leadership. Focus on the PPPs to be included in the update.	The group reviewed the regional water planning objectives, update process, and timeline, and went over the process for commenting on the draft RWP. The steering committee membership was reviewed, and the group discussed how to fill the vacancies. There was also a discussion of the Northeast New Mexico region's administrative water supply revision, the public involvement plan (Section 2), key strategies (Section 8), and next steps.
April 4, 2016	Tucumcari Convention Center, Tucumcari, New Mexico	Review the PPPs to be included in the update, define the key collaborative PPP recommendations specific to Section 8.	The group broke into small groups to review the draft PPP table and provide feedback. The group also defined the regional collaborative projects, identified the key program and policy recommendations to inform the state water plan, and discussed the planning process next steps.
May 16, 2016	Tucumcari Convention Center, Tucumcari, New Mexico	Review the Public Involvement section (2) and the Section 8 key strategies and PPP list.	The group discussed comments on the drafts of Sections 2 and 8 and the Executive Summary, the comment process, and next steps.



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NORTHEAST NEW MEXICO
REGIONAL WATER PLAN 2016

Regional Map

Figure 3-1

- Union County: 3,830 square miles
- Harding County: 2,125 square miles
- Quay County: 2,881 square miles
- Curry County: 1,408 square miles
- Roosevelt County: 2,454 square miles

Elevations in the Northeast New Mexico planning region range from 8,826 feet above mean sea level (ft amsl) at Laughlin Peak in northwestern Union County to 3,600 ft amsl in Quay County where the Canadian River flows into Texas.

The Northeast New Mexico planning region as a whole is sparsely populated. The land use in the region is predominantly agricultural, and both dry land and irrigated farmland are prevalent. Development of significant amounts of groundwater in the High Plains did not occur until the technology to drill deep wells and to pump groundwater became available. Development of groundwater for irrigation began in the 1940s and expanded throughout the 1950s, and irrigation of large areas continues today. The dairy industry and related milk processing industries (e.g., cheese) are located in Quay, Curry, and Roosevelt counties, and ranching predominates in the northern part of the region. Ute Reservoir, located in Quay County, will be used in the future for municipal and industrial water supply in Quay (the Tucumcari Quay County Regional Water Authority project) and Curry and Roosevelt (the Eastern New Mexico Rural Water System project) counties. The reservoir also provides incidental recreational benefits.

3.2 Climate

The Northeast Region covers an extremely large area, and the average annual temperatures in the region range from 51 degrees Fahrenheit (°F) at Pasamonte to almost 59°F in San Jon, east of Tucumcari. Average annual precipitation in the region ranges between 15.5 inches at Pasamonte, in southwestern Union County, and 16.8 inches in Portales.

As noted in the 2007 RWP, drought is an important factor in water planning in the region. During the past century, severe droughts have occurred in 1887-1897, 1910-1913, 1932-1938, 1952-1957, 2002-2004, and 2011-2015. Conversely, the wet period of the 1980s into the 1990s was just as anomalous as the severe droughts (Gutzler, 2003) and should not be used as a “normal” standard in terms of precipitation expectations.

3.3 Major Surface Water and Groundwater Sources

Surface flows originate primarily in the higher elevations, as snowmelt during the spring and as monsoonal rainfall during the late summer. Approximately 13 percent of the water currently used in the planning region is supplied by surface water, 57 percent of which is used for irrigated

agriculture and the other 43 percent used primarily for reservoir evaporation. Though no drinking water is currently supplied by surface water, the Tucumcari Quay County Regional Water Authority and Eastern New Mexico Rural Water System projects are being designed to supply renewable surface water for future municipal and industrial needs in the central and southern part of the Northeast New Mexico planning region.

The dominant waterways flowing in the region are the Canadian and Dry Cimarron rivers (Figure 3-1), and flows vary greatly from year to year. The Canadian River and tributaries are shared with the Colfax and Mora-San Miguel-Guadalupe water planning regions to the west. The Dry Cimarron River and tributaries are shared with the Colfax water planning region.

Groundwater supplies all of the communities in the region, and numerous stock and domestic wells are also located throughout the region. Approximately 87 percent of the water currently used in the planning region is supplied by groundwater, 93 percent of which is diverted for irrigated agriculture and the other 7 percent used primarily for municipal and livestock purposes. Groundwater is found primarily in sedimentary rocks and alluvial valleys within the region, and the yield and quality of this water is highly variable. The Ogallala aquifer is a key resource in the region, and rapid water level declines in some portions of this aquifer are a key planning issue.

The Northeast New Mexico Water Planning Region overlies parts of the Clayton, Canadian River, Tucumcari, Fort Sumner, Curry, Portales, Causey Lingo, and Roswell Underground Water Basins (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.) These basins are shared with the following water planning regions:

- Colfax (Clayton, Canadian River, and Tucumcari)
- Mora-San Miguel-Guadalupe (Canadian River, Tucumcari, Fort Sumner, and Roswell)
- Lower Pecos Valley (Fort Sumner, Roswell, and Causey Lingo)

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

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

3.4 Demographics, Economic Overview, and Land Use

Table 3-1 provides the 2013 populations of Union (4,370), Harding (693), (Quay 8,662), Curry (50,598), and Roosevelt (19,955) counties. Curry and Roosevelt counties were the only counties in the planning region to grow in population between 2010 and 2013.

Table 3-1 Summary of Demographic and Economic Statistics for the Northeast New Mexico Water Planning Region

a. Population

County	2000	2010	2013
Union	4,174	4,549	4,370
Harding	810	695	693
Quay	10,155	9,041	8,662
Curry	45,044	48,376	50,598
Roosevelt	18,018	19,846	19,955
Total Region	78,201	82,507	84,278

Source: U.S. Census Bureau, 2014a

b. Income and Employment

County	2008-2012 Income [a]		Labor Force Annual Average 2013 [b]		
	Per Capita ($)	Percentage of State Average	Number of Workers	Number Employed	Unemployment Rate (%)
Union	20,488	86	1,891	1,796	5.0
Harding	19,401	80	381	365	4.2
Quay	18,775	79	3,720	3,484	6.3
Curry	21,179	89	21,422	20,344	5.1
Roosevelt	18,086	76	9,328	8,861	5.0
Total Region	—	—	36,742	34,850	5.1

[a] U.S. Census Bureau, 2014c, American Community Survey 5-Year Estimate

[b] NM Department of Workforce Solutions, 2014

Table 3-1 Summary of Demographic and Economic Statistics for the Northeast New Mexico Water Planning Region

c. Business Environment

County	Industry	Number Employed	Number of Businesses
	2008-2012 [a]		*2012*
Union	Agriculture	492	108
	Education/Healthcare	424	
	Construction	235	
	Retail trade	175	
	Government	160	
Harding	Education/Healthcare	63	10
	Construction	48	
	Agriculture	44	
	Services	21	
	Transportation/Utilities	20	
Quay	Education/Healthcare	811	238
	Construction	475	
	Agriculture	337	
	Retail trade	331	
	Arts/Recreation/Accommodation/Food service	281	
Curry	Education/Healthcare	4,607	1066
	Retail trade	2,338	
	Construction	1,875	
	Arts/Recreation/Accommodation/Food service	1,870	
	Government	1,845	
Roosevelt	Education/Healthcare	2,448	339
	Retail trade	1,212	
	Agriculture	772	
	Arts/Recreation/Accommodation/Food service	755	
	Transportation/Utilities	70	

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

Table 3-1 Summary of Demographic and Economic Statistics for the Northeast New Mexico Water Planning Region

d. Agriculture

County	Farms / Ranches [a]			Most Valuable Agricultural Commodities[b]
	Number	Acreage		
		Total	Average	
Union	353	1,967,370	5,573	Cattle, calves Hay, other silage Grains (Corn, Wheat)
Harding	202	1,034,059	5,119	Cattle, calves Horses, ponies, mules Hogs, pigs
Quay	553	1,518,085	2,745	Cattle, calves Hay, other crops Grains, beans, peas
Curry	600	880,822	1,468	Milk from cows Cattle and calves Grains, beans, peas Hay, other crops
Roosevelt	680	1,349,222	1,984	Milk from cows Cattle and calves Hay, other crops Grains, beans, peas
Total Region	2,388	6,749,558	2,826	—

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

Farming and ranching have traditionally driven the economies of Union, Harding, and Quay counties, which have been adversely affected by the drought. Curry County's economy benefits from the presence of Cannon Air Force Base (AFB); dairy farms historically have also been important, but the Clovis area has lost several dairies over the past three years due to low milk prices and high feed prices. The Roosevelt County economy—mainly the city of Portales—also benefits from the proximity of the base, as well as the presence of Eastern New Mexico University. The largest employment category in the region is education/healthcare, employing the most people in every county except Union County, where agriculture is the biggest employer. Agriculture is the largest water user in the region.

Per capita incomes vary in this region, with Curry County having the highest at $21,179 and Roosevelt County the lowest at $18,086.

Land in the Northeast New Mexico Water Planning Region is owned by various federal, tribal, state, and private entities, as illustrated on Figure 3-2 and outlined below:

- Federal agencies: 259 square miles
- State agencies: 2,023 square miles
- Private entities: 10,413 square miles

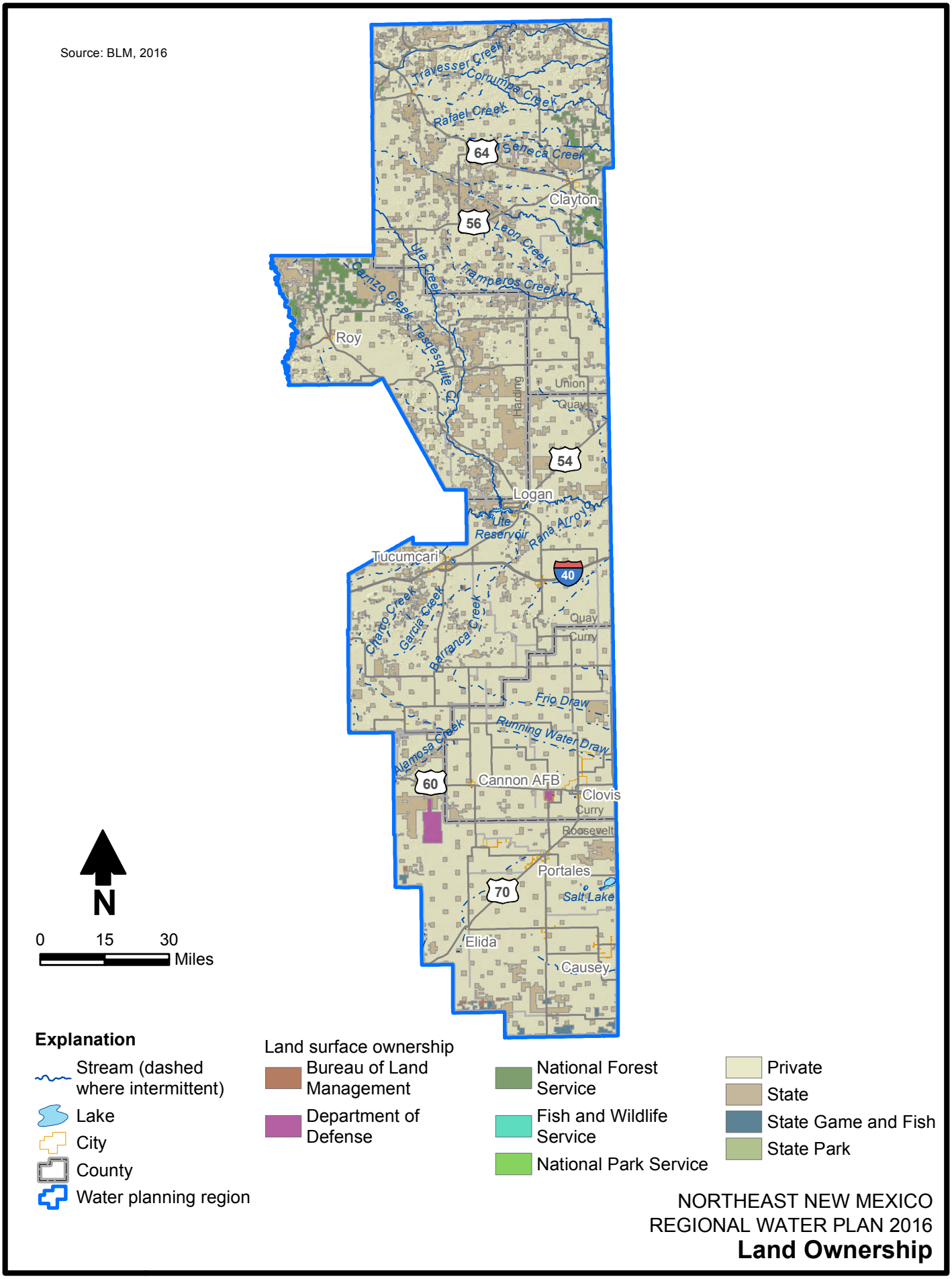
Current statistics on the economy and land use in each county, compiled from the U.S. Census Bureau and the New Mexico Department of Workforce Solutions, are summarized in Table 3-1. Additional detail on demographics, economics, and land use within the region is provided in Section 6.

4. Legal Issues

4.1 Relevant Water Law

4.1.1 State of New Mexico Law

Since the accepted regional water plan for the Northeast New Mexico Water Planning Region was published in 2007, 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 Northeast New Mexico region is discussed in Section 4.1.2.



NORTHEAST NEW MEXICO
REGIONAL WATER PLAN 2016

Land Ownership

Figure 3-2

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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 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 Northeast New Mexico 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. The Canadian River basin was designated as a priority basin beginning in 2011 and each year since then through 2016.

4.1.1.10 Acequia Water Use

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

NMSA 1978, §§ 73-27-1 through 19 (2010) created the Eastern New Mexico Water Utility Authority (ENMWUA). According to the statute, the purposes of the ENMWUA are to:

- Develop and construct a water delivery system based on a funding formula whereby up to 75 percent of the overall capital cost of the system is to be paid for by the federal government, 15 percent is to be paid for by the State of New Mexico, and 10 percent is to be paid for by the local governments that have the power to appoint members to the board of the ENMWUA.

- Deliver water to the local governments within the boundaries of the authority, but not compete with local governments for rights to deliver water to ultimate end-users.

The ENMWUA is discussed further in Section 4.1.2.5.

4.1.2.2 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). The

Roswell Artesian Basin, a very small portion of which is in the Northeast New Mexico planning region, has a water master.

4.1.2.3 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 Northeast New Mexico region includes the following UWBs: Canadian River, Causey Lingo, Clayton, Curry County, Fort Sumner, Portales, Roswell, and Tucumcari (Figure 4-1). Administration of these basins is discussed at length in the 2007 plan, Section 4.7.4. Since the publication of the 2007 plan, the following administrative actions have been taken in the region:

- Curry County and Portales UWBs: Due to the declines in the High Plains Aquifer, in 2009 the State Engineer ordered the closure of the aquifer within the Curry County and Portales UWBs to new appropriations (In the Matter of the Closure of the High Plains Aquifer Within the Curry County and Portales Underground Water Basins to New Appropriations Under Section 72-12-3 NMSA 1978 (11/13/09)). The review of water right applications are governed by the *Curry County and Portales Basin Guidelines for Review of Water Right Applications* (NMOSE, 2010). The guidelines set forth procedures for processing applications filed in the basins in a manner that reflects the severe declines in the underlying aquifer. Under the guidelines, applications for new water appropriations from the High Plains Aquifer within the Curry County and Portales UWBs will be denied. The guidelines also mandate the metering of non-domestic and livestock water wells.

- Fort Sumner UWB: The State Engineer has order the metering of groundwater in the Fort Sumner UWB, except for domestic and livestock wells. State Engineer Order No. 183 [Requirements for Metering Groundwater in the Ft. Sumner Underground Water Basin of the Lower Pecos River Basin (5/23/13)].

4.1.2.4 AWRM Implementation in the Basin

No AWRM regulations have been issued for the basin.

4.1.2.5 Special Districts in the Basin

Special districts are discussed at length in the 2007 plan, Section 4.2. Special districts are various districts within the region having legal control over the use of water in that district. All are subject to specific statutes or other laws concerning their organization and operation. In the Northeast New Mexico region, special districts include the ENMWUA, the Arch Hurley Conservancy District, and soil and water conservation districts (SWCDs), which are governed by NMSA 1978, §§73-20-25 through 48.

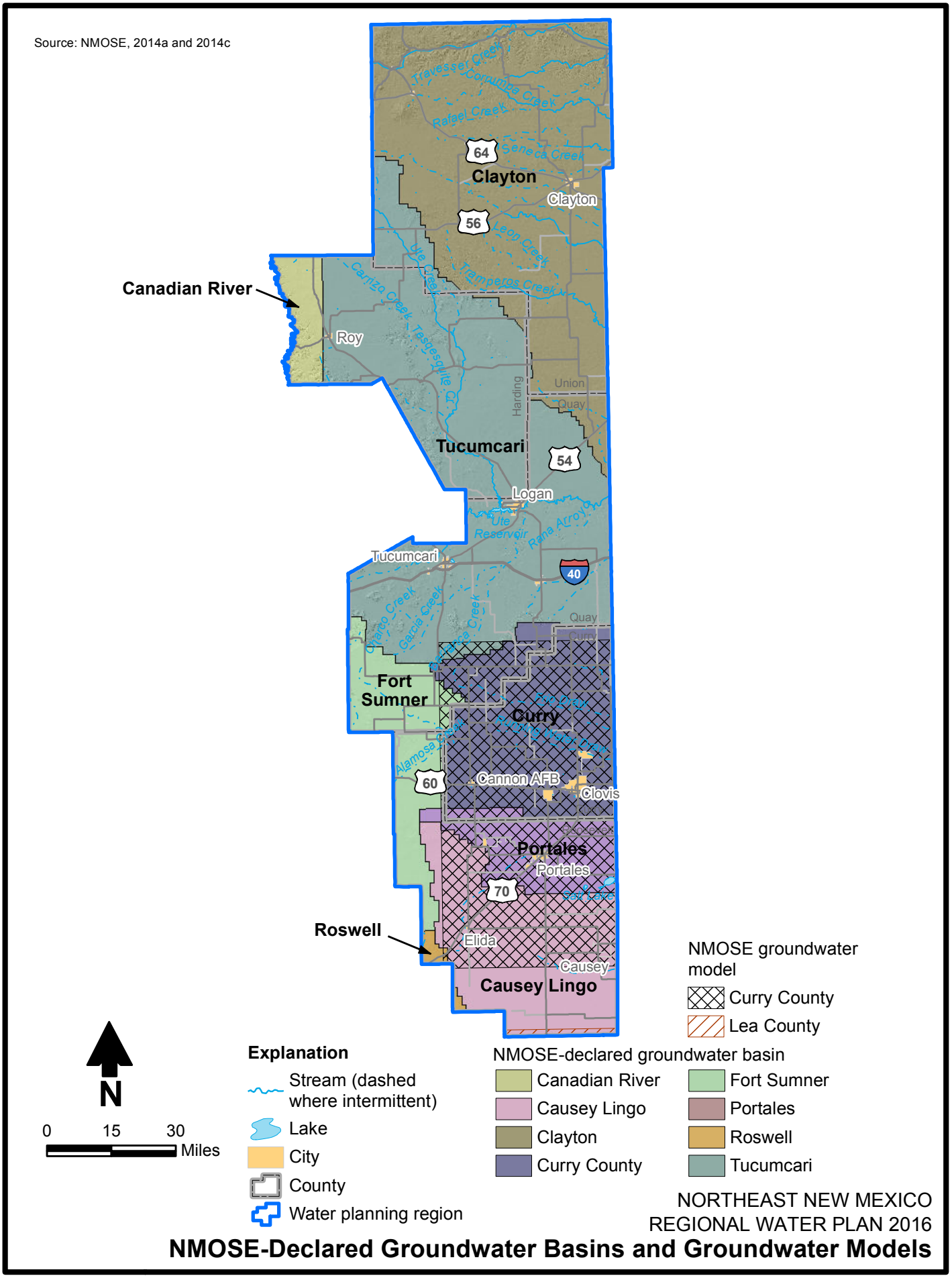

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Figure 4-1

The ENMWUA is discussed at length in the 2007 plan, Section 4.8. The ENMWUA was proposed in order to construct the Eastern New Mexico Rural Water System. The project was authorized on March 30, 2009 (Omnibus Public Land Management Act of 2009 (P.L. 111-11; 123 Stat. 991 [1300-1303]; Appendix A). The project components consist of construction of a pipeline and associated intake, storage, pumping, water treatment, and delivery facilities from Ute Reservoir to deliver 16,450 acre-feet per year to participating communities (municipalities of Clovis, Elida, Grady, Melrose, Portales, and Texico, Curry and Roosevelt counties, and Cannon AFB). The statute authorizing creation of the ENMWUA is discussed in Section 4.1.2.1. The project is still ongoing. At the time of writing, the ENMWUA had built its intake structure at Ute Reservoir and was completing the design for an interim pipeline project that will serve Clovis, Cannon AFB, Portales, and other customers. Easements are being acquired and project construction will begin in early 2017.

In 2014, the Village of Logan filed suit against the ENMWUA and the U.S. Bureau of Reclamation (USBR) claiming violations of the National Environmental Policy Act (NEPA). Logan sought to enjoin the eastern New Mexico project, claiming that the ENMWUA and USBR had violated NEPA in conducting the environmental assessment required by the Act. Specifically, Logan asserted that the USBR had failed to take a hard look at the actual and potential adverse environmental consequences of the project. Both the Federal District Court in New Mexico and the Tenth Circuit Court of Appeals ruled against Logan, holding that an injunction was not warranted. *See Village of Logan v. United States Dept. of Interior*, 577 Fed. Appx.760 (10th Cir. 2014).

Although not organized under a specific state law, the City of Tucumcari, Villages of Logan, House, and San Jon, and Quay County have organized under a joint powers agreement (JPA) as the Ute Reservoir Regional Water Board to address water issues in the region separate and apart from the ENMWUA. The Ute Reservoir Regional Water Board prepared and subsequently updated the 40-year water plan for Quay County. Also, in January 2012, Quay County, Tucumcari, Logan, and San Jon entered into another JPA establishing the Tucumcari Quay County Regional Water Authority to administer the member entities' water allocation from Ute Reservoir, including funding and construction of any facilities necessary to utilize that water allocation (City of Tucumcari et al., 2012).

4.1.2.6 State Court Adjudications in the Basin

Adjudications in the Northeast New Mexico region are discussed in the 2007 plan, Section 4.7.2.

4.1.3 Federal Water Laws

The law of water appropriation has been developed primarily through decisions made by state courts. Since the accepted plan was published in 2007 several federal cases have been decided examining various water law questions. These cases are too voluminous to include here, and many of the issues in the cases will not apply directly to the region. However, New Mexico is a

party to one original jurisdiction case in the U.S. Supreme Court involving the Rio Grande Compact and waters of the Lower Rio Grande. Because of its importance to the entire state it is included here.

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

4.1.3.1 Federal Reservations

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

- Cannon Air Force Base
- Melrose Air Force Range
- Kiowa National Grasslands

4.1.3.2 Interstate Stream Compacts

Interstate compacts become federal law once ratified by Congress. The Canadian River Compact and the associated Amended Supreme Court Degree issued in 1993 govern water use on the portion of the Canadian River within the Northeast New Mexico region and is discussed in the 2007 plan, Section 4.7.1.

4.1.3.3 Treaties

Not applicable.

4.1.3.4 Federal Water Projects

The ENMWUA project is not a federal project, but is funded in large part by the federal government and is being developed with strong participation from the USBR. The project is discussed in Section 4.1.2.5.

4.1.3.5 Federal Adjudications in the Basin

Not applicable.

4.1.4 Tribal Law

Not applicable.

4.1.5 Local Law

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

4.1.5.1 Curry County

Water use in Curry County is regulated through its subdivision regulations, and guided by several resolutions and the *Curry County-City of Clovis Comprehensive Plan-Joint Action Guide* (Consensus Planning Engineers, Inc. 2007).

Curry County's current subdivision regulations were adopted by Resolution No. 2014-27, amending the 2006 regulations, and contain several provisions relating to water use. Section 7.7 of the regulations requires a subdivider to submit water quality documentation, Section 7.10 requires that certain water conservation measures apply to all subdivisions, Section 7.11 requires a subdivider to quantify the maximum allowable water use per year for the subdivision, Section 7.13 addresses community water systems, and Sections 7.12 and 7.14 require the subdivider to provide a water availability assessment.

The purpose of the Comprehensive Plan-Joint Action Guide is to identify issues common to both the County and City and make recommendations on what general steps the County and City can cooperatively take to address the issue. Regarding water, the Guide recommends that the County and City should (1) continue to cooperate on the Eastern New Mexico Rural Water System, (2) develop policies and regulations regarding individual wells and hook-ups to the City water system, (3) develop and adopt common policies/requirements for water reclamation for certain water intensive uses, (4) establish a joint task force to identify and mitigate abandoned and/or leaking fuel and similar tanks that have a potential to contaminate the water supply, (5) consider raising the minimum parcel size that private wells are allowed to be constructed on, and (6) jointly prepare and adopt a wellhead protection program to protect wells from local sources of contamination.

Curry County has also enacted a couple of resolutions relating to water management. The County passed a resolution supporting funding initiatives for water conservation measures to preserve the Ogallala Aquifer (Resolution No. 2014-52) and another that demonstrates the County's support of the Eastern New Mexico Rural Water Project (Resolution No. 2010-56).

4.1.5.2 City of Clovis

Use of water is regulated in the City of Clovis through its Water Management Ordinance set forth in the City Code and is guided by the City of Clovis Comprehensive Plan (Consensus Planning Engineers, Inc. 2007).

The City's Water Management Ordinance states that it is the policy of the City to protect and conserve the consumption of water in order to insure and protect the availability of the supply of water for all residents and citizens of the City (Section 13.24.10). The ordinance includes water conservation stages depending on certain water supply conditions (Section 13.24.20). The ordinance also recommends year-round usage restrictions (Section 13.24.60). The Comprehensive Plan recognizes that water supplies are crucial to the continued wellbeing of the City's residents and economy and that new sources and conservation of existing water resources must be identified and acquired. The Plan outlines five water goals for the City: (1) increase conservation, (2) reduce the drain on the aquifer, (3) identify new water sources for long-term supply, (4) obtain grants for the construction of water improvements, and (5) protect the quality of existing water supplies.

4.1.5.3 Harding County

Harding County has no specific ordinances or comprehensive plan relating to water use.

4.1.5.4 Quay County

Water use in Quay County is regulated through its subdivision ordinance and guided by the *Quay County Regional Comprehensive Plan Update* (Phelps Engineering and Development Services, 2010 Addenda).

The Quay County Subdivision Regulations, Ordinance 35, requires that subdividers provide an acceptable quantity and quality of water for the subdivision, as well as a water supply plan. Sections 4.5(1)(b) and 4.5(2)(a).

The Quay County Comprehensive Plan Update serves to update the 2005 Quay County Regional Comprehensive Plan. The updated Plan sets forth a number of goals related to water management in Quay County. They include protecting and preserving well water resources throughout the County and requiring or encouraging water conservation methods and working cooperatively with communities in the County to implement such methods. The Plan also includes a number of water management policies, including developing a region-wide drought mitigation plan, developing strategies to reuse reclaimed effluent and treated wastewater, and encouraging the establishment of shared domestic well systems.

4.1.5.5 City of Tucumcari

Water use in the City of Tucumcari is regulated through its municipal code and guided by the *City of Tucumcari Comprehensive Plan* (City of Tucumcari, 2004).

The City of Tucumcari's Municipal Code sets forth a number of provisions relating to water use and conservation. The Code prohibits water waste (Section 13.06.030) and sets water conservation levels based upon the relationship between water demand and municipal safe production and delivery capability (Section 13.06.046). The Code also mandates that subdividers provide evidence prepared by a qualified engineer or engineering geologist that a 50-year supply of potable water is available to the proposed subdivision (Section 17.04.020(C)(2)(d).

The Comprehensive Plan sets forth the following goals relating to water use: (1) ensure that the City's water and wastewater systems are expanded or improved to accommodate future growth, (2) enhance the quality of life by providing safe, efficient, affordable, and responsible use of water, and (3) plan and work with local entities to utilize available water resources for the long-term interest of the area. In order to meet these goals, the City's water use policies include taking and encouraging water conservation measures, improving water storage, and developing uses for wastewater effluent.

4.1.5.6 Roosevelt County

Roosevelt County addresses water use through Ordinance 93-7, which is a broad land use policy ordinance. In addressing water, the ordinance recognizes that the County's protection and development of its water resources are essential to its short- and long-term economic and cultural viability. The Ordinance also mandates that any transfer of water use be carefully considered in relationship to the history, traditions, culture, customs, and economy of the County. The ordinance further declares that the County shall promote and pursue development of existing and future water rights. The ordinance also requires that the County be notified of all intrastate, state, and federal actions that have impact on the water of the County.

4.1.5.7 City of Portales

The City of Portales regulates water use through two plans: the *Water Conservation Plan* (Wilson, 2014) and the *Water Conservation and Drought Contingency Plan* (2013).

The *Water Conservation Plan* describes measures to be undertaken by the City to promote water conservation within the City's Water Utility Department service area. The Plan provides an overview of the need for conservation and a summary of the conservation measures that are expected to meet that need. The Plan updates the City's 2001 Water Conservation Plan by providing information on current water supply and use trends, an updated water demand reduction goal, evaluations of the City's water supply system and water use, and enhanced water conservation measures that have been adopted by the City to meet that goal.

The goal of the *Water Conservation and Drought Contingency Plan* is to conserve water resources and provide drought management restrictions. Under the Plan, drought management restrictions apply when water availability, well pumping conditions, temperature and weather

considerations, and other factors indicate the need for restriction of water consumption in order to preserve and protect water supplies for essential needs. The Plan describes recommended ongoing conservation practices and outlines the three stages of water rationing and restriction.

4.1.5.8 Union County

Union County has no specific ordinances or comprehensive plan relating to water use.

4.2 Relevant Environmental Law

4.2.1 Species Protection Laws

4.2.1.1 Federal Endangered Species Act

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

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

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

The species in the planning region that are subject to protection under the ESA are:

- Least tern (endangered; final recovery plan): Curry and Quay counties
- Sprague's pipit (candidate): Curry, Roosevelt, and Union counties
- Arkansas River shiner (threatened; draft recovery plan): Quay County

Of the threatened and endangered species found in the Northeast New Mexico region, the protection and recovery of the Arkansas River shiner is most likely to affect water planning within the region. In particular, any actions that are likely to harm the habitat used by this species will be subject to strict review and possible limitation. Related to its protection, the Arkansas River Shiner Management Plan was adopted in 2005 by several key stakeholders in New Mexico and Texas. Based on institution of the plan, the USFWS did not list the Canadian River from Ute Dam in New Mexico to Lake Meredith in Texas as critical habitat. Efforts under the terms of the plan to protect Arkansas River shiner habitat and monitor its population in this stretch of river are ongoing.

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 Northeast New Mexico 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 Northeast New Mexico planning region, numerous segments of the Canadian, Upper Canadian, and Upper Pecos rivers are on the impaired list.

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

4.2.2.1.2 Dredge and Fill Permit Program (Section 404)

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

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

4.2.2.1.3 Waters of the United States

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

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

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

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

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

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

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

4.2.2.2 Federal Safe Drinking Water Act

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

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

4.2.2.3 Federal Comprehensive Environmental Response, Compensation, and Liability Act

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

4.2.2.4 New Mexico Water Quality Act

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

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

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

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

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

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

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

4.2.2.5 New Mexico Drinking Water Standards

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

4.2.2.6 Tribal Law

Not applicable.

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

The ENMWUA water supply project remains controversial in the region, as evidenced by the lawsuit discussed in Section 4.1.2.5. While many entities have joined the Authority, some have specifically removed themselves from the Authority and are pursuing other ways of maintaining water supply. As the Ogallala Aquifer supply continues to decline, the project will play an important role in the water supply of the region and this issue will continue to be important to water planning.

5. Water Supply

This section provides an overview of the water supply in the Northeast New Mexico 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 *Northeast New Mexico Regional Water Plan* (DBS&A, 2007) and where appropriate, updated with more recent information and data, as referenced throughout this section.

Currently some of the key water supply updates and issues impacting the Northeast New Mexico region are:

- The Curry and Portales UWBs have been closed to new appropriations. This area has a very limited saturated thickness and relatively high rates of water level decline. The life expectancy of the groundwater supply in the Portales and Clovis area is predicted to be less than 13 and 20 years, respectively, according to analysis using groundwater models (Section 7). New sources of groundwater supply have not been identified. A number of communities in the Curry and Portales basins plan on using the Eastern New Mexico Rural Water System Project as an alternate supply when the High Plains Aquifer is no longer a viable source of water. The groundwater basins, along with conservation measures and reuse projects, will remain a backup source in times of drought. Water levels in these basins are also affected by groundwater pumping in Texas.

- For the climate divisions within the planning region (New Mexico Climate Divisions 2 and 3), 2011, 2012, and 2013 were all severe to extreme drought years (NCDC, 2014), and the winter snowpack for 2014 was also very low. As of January 2014, agricultural irrigators in all five counties in the planning region (along with 22 other New Mexico counties) were eligible for emergency drought assistance through the farm service agency (Udall, 2014). As of May 2015, Union, Harding, and Quay counties were designated as primary counties for 2015 crop disaster losses. Curry and Roosevelt counties were also eligible for drought assistance, since they were designated as contiguous counties (USDA FSA, 2015).

- The region must ensure continued compliance with the terms of the Canadian River Compact, ratified in 1951, as well as the 1993 Supreme Court Decree in *Oklahoma and Texas v New Mexico,* which allow New Mexico free and unrestricted use of all waters originating in the drainage basin of the Canadian River above Conchas Dam and free and unrestricted use of water originating below the dam, with the amount of water that may be stored or impounded limited to an aggregate of 200,000 acre-feet of conservation storage.

- Quay County and the local governments of Tucumcari, Logan, and San Jon entered into a joint powers agreement in January 2012 to establish the Tucumcari Quay County Regional Water Authority (TQCRWA) to address water planning in Quay County (City of Tucumcari et al., 2012). The TQCRWA is working on developing a project separate from the ENMRWS project that would deliver the Ute Reservoir allocation for these member communities within Quay County.

- The TQCRWA has entered into a contractual arrangement with Brookfield Properties for installation of an intake structure on the south side of Ute Reservoir. A temporary interim intake structure has already been built on the south side of the reservoir and is being used to provide water for the golf course at Ute Lake Ranch subdivision. However, by motion on August 31, 2011 (NMISC, 2011), the NMISC took the position that the

Eastern New Mexico Water Utility Authority (ENMWUA) intake structure will be the only intake structure at the reservoir (the NMISC previously approved the design of the proposed Quay County intake structure), with access to the already built interim intake as a backup supply only. The TQCRWA would like to install an intake structure and treatment plant on the south side of Ute Reservoir to provide Quay County users with surface water for municipal and industrial use, rather than using the ENMWUA intake and treatment facilities.

- Groundwater levels continue to decline in the Ogallala aquifer, and the ENMWUA is in the process of constructing the Eastern New Mexico Rural Water System to provide surface water from Ute Reservoir to counties and communities in Curry and Roosevelt counties for municipal and industrial use. However, the pipeline will not provide water for irrigation, which is the main water use in the region. The project's current focus is on the interim pipeline.

- In order to extend the City's water supply before the ENMWUA project comes online, the City of Clovis is in the process of implementing a wastewater reuse project, plans to install six wells and lease the water to EPCOR Water (the private water supplier), is buying water rights adjacent to Cannon AFB, and is creating a special conservation district where irrigation will be retired to slow the groundwater level declines.

- EPCOR Water has a comprehensive water conservation program, which includes increasing block rates, public outreach, residential and non-residential rebates, and water conservation audit and retrofit kit giveaways. EPCOR Water also has a water leasing program, where they work with farmers to shift water use from agricultural to municipal use. Under the leasing program, well owners are responsible for the wells meeting potable water supply standards, and EPCOR Water runs the necessary transmission lines to connect the wells to the system. EPCOR Water then operates the leased wells and buys wet water from the owners. This program will be expanded in the future.

- Portales has completed a number of studies evaluating possible sources for municipal supply. To extend the City's water supply before the ENMWUA supply comes online, the City is implementing wastewater reuse and more stringent conservation measures, and has purchased land and water rights, retiring agricultural production to create a groundwater reserve. The City is also evaluating aquifer storage and recovery projects using treated wastewater.

- Given the region's current heavy reliance on groundwater, water quality in the High Plains and other aquifers is of utmost importance. Potential threats to groundwater quality that were identified in the original plan include leaking underground storage tanks (USTs), septic systems, agricultural activity and dairy operations, sewage treatment plants, and petroleum, methane, and total dissolved solids (TDS) contamination from oil

and gas field operations. In addition, surface water quality concerns were identified for playa lakes, which are the primary source of recharge for the High Plains aquifer.

- The potential impacts of septic tanks to water quality, especially along the shores of Ute Reservoir are of particular concern. The Village of Logan completed a $15 million wastewater and sewer extension project in January 2010 to connect all homes and business located on the north side of Ute Reservoir and all state park restrooms and rest stations to the sewer system (Wallin, 2015); the resulting decreased reliance on septic systems is expected to improve water quality in and around the lake.

- There are 63 small public water systems in the region. Though the source water for these systems is generally of good quality, the maintenance, upgrades, training, operation, and monitoring that is required to ensure delivery of water that meets drinking water quality standards can be a financial and logistical challenge for many of these systems.

- The New Mexico Environment Department (NMED) periodically tests fish in New Mexico lakes and reservoirs for mercury, which in the form of methylmercury can be very toxic over long periods of exposure at low levels. Due to mercury detected in some fish at concentrations that could lead to significant adverse human health effects, fish consumption advisories have been issued for Clayton Lake and Ute Reservoir (NMG&F et al., 2015). The source of the mercury is most likely atmospheric deposition.

- Concentrations of nitrogen, phosphorus, suspended solids, and salt may increase in the future in response to increased surface water evaporation rates and increased precipitation intensity. Intense storms wash a greater volume of pollutants into rivers, which in recent years have had a decreased overall flow volume (USBR, 2013) with which to dilute the concentrations of contaminants. In addition, higher water temperatures can lead to less dissolved oxygen, which is a problem for many aquatic species.

5.1 Summary of Climate Conditions

The accepted regional water plan (DBS&A, 2007) 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 Northeast New Mexico 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 Union, Harding, Quay, Curry, and Roosevelt counties and identifies six stations that were used for analysis of weather trends. These six stations were selected based on location, how well they represented conditions in their respective counties, and completeness of their historical records. The locations of the climate stations for which additional data were analyzed are shown in Figure 5-1. No snow course or snowpack telemetry (SNOTEL) stations are present within the Northeast New Mexico planning region, so two stations located outside of the planning region, in Taos and Colfax counties, have been used to document snowfall nearby.

Long-term minimum, maximum, and average temperatures for the six climate stations are detailed in Table 5-2, and average summer and winter temperatures for each year of record are shown on Figures 5-2a through 5-2c.

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 annual precipitation data for the selected stations are shown on Figures 5-4a through 5-4c. Table 5-2 lists the minimum, maximum, and long-term average annual precipitation (rainfall and snowmelt) at the six representative stations in the planning region. The long-term averages, however, do not reflect the considerable variability of precipitation, which creates a direct challenge for water supply planning. The variability in total annual precipitation for climate stations in the region with long-term records is shown in Figure 5-4a through 5-4c and is also reflected in the data for the SNOTEL stations in nearby Taos and Colfax counties (Figure 5-5) and by the drought indices discussed below. In addition to annual variability, monthly variability also presents a challenge: snowmelt and/or monsoon flows may not occur at times when water is most needed for agriculture or other uses.

While the Natural Resources Conservation Service (NRCS) does not operate any SNOTEL or snow course stations in the planning region, data for stations upstream of the region in Taos and Colfax counties are provided (Figure 5-5) (NRCS, 2014a).

- The North Costilla SNOTEL site, located at 10,600 ft amsl on the eastern flank of the Sangre de Cristo Mountains, measures snowpack near the headwaters of the Canadian River. Snow water equivalent data have been collected at this site since 1979.

- The Tolby SNOTEL site is located at 10,180 ft amsl near the headwaters of the Canadian River. At this site, snow water equivalent data have been collected since 1998, and snow depth data have been collected since 1992.

Table 5-1. Northeast New Mexico Climate Stations

Page 1 of 3

Climate Stations [a]	Latitude	Longitude	Elevation	Precipitation		Temperature	
				Data Start	Data End	Data Start	Data End
Union County							
Amistad 3 ESE	35.92	–103.10	4,495	4/1/1925	Present	7/1/1934	Present
Capulin 6 SSE	36.67	–103.95	7,205	1/1/1930	9/30/1979	1/1/1930	12/31/1969
Capulin NM	36.78	–103.97	7,293	4/1/1966	9/30/1979	4/1/1966	9/30/1979
Clayton 9 SSE	36.33	–103.10	4,905	8/1/1907	12/31/1959	9/1/1907	12/31/1959
Clayton WSO Airport	36.45	–103.15	4,970	2/28/1896	Present	2/28/1896	Present
Des Moines	36.75	–103.83	6,620	4/1/1916	6/30/1994	4/1/1916	6/30/1994
Gladstone	36.22	–103.93	5,755	12/1/1920	4/30/1957	12/1/1920	9/30/1922
Grenville	36.59	–103.62	6,002	11/1/1940	Present	11/1/1940	Present
Hayden	36.05	–103.22	4,803	5/1/1909	10/31/1965	5/1/1909	2/28/1934
Ione	35.75	–103.30	4,705	9/1/1910	3/31/1963	—	—
Long Canyon	37.00	–103.65	5,325	3/1/1941	8/31/1959	7/1/1947	10/1/1947
Pasamonte	36.30	–103.74	5,650	1/1/1910	Present	6/1/1925	Present
Pennington	36.32	–103.58	5,604	2/1/1925	12/31/1959	—	—
Rutledge Ranch	36.95	–103.10	4,442	4/1/1941	8/31/1959	—	—
Sedan 7 NW	36.20	–103.22	4,774	3/1/1911	4/30/1960	—	—
Stead	36.10	–103.20	4,803	9/1/1965	6/1/1975	—	—
Harding County							
Bueyeros 4 NW	36.02	–103.73	4,682	7/1/1929	1/31/1968	9/1/1964	1/31/1968
Hoosier Ranch	35.87	–104.17	5,682	7/1/1911	5/31/1949	—	—
Mills	36.07	–104.20	6,053	10/1/1911	1/31/1951	6/1/1923	10/31/1933
Mosquero	35.80	–103.93	5,472	8/1/1926	Present	8/1/1926	Present
Palo Verde	36.02	–104.08	8,806	8/1/1911	12/31/1947	—	—

Source: WRCC, 2014 — = Information not available

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

Table 5-1. Northeast New Mexico Climate Stations

Page 2 of 3

Climate Stations [a]	Latitude	Longitude	Elevation	Precipitation		Temperature	
				Data Start	Data End	Data Start	Data End
Harding County (cont.)							
Roy	35.94	–104.20	5,868	10/1/1905	Present	10/1/1905	Present
Solano	35.87	–104.05	5,604	5/1/1909	8/31/1959	5/1/1909	12/31/1913
Yates 6S	36.05	–103.87	5,604	10/1/1929	8/31/1959	—	—
Quay County							
Cameron	34.90	–103.44	4,580	9/1/1927	5/31/1998	4/1/1950	5/31/1998
Endee 5 SSE	35.07	–103.07	4,104	1/1/1941	6/30/1959	—	—
Forrest	34.80	–103.60	5,003	11/30/1939	2/28/1961	—	—
Glen Rio	35.18	–103.05	3,862	4/1/1922	2/28/1937	—	—
Hassell	34.72	–104.02	4,905	7/1/1929	6/30/1959	—	—
House	34.63	–103.89	4,825	10/1/1940	Present	—	—
Logan	35.37	–103.42	3,832	2/1/1906	1/31/1960	1/1/1906	1/31/1960
Mc Carty Ranch	35.60	–103.36	4,410	11/1/1983	Present	11/1/1983	Present
Montoya	35.00	–103.93	4,344	7/1/1909	7/31/1957	—	—
Nara Visa	35.62	–103.10	4,193	8/1/1905	9/30/1966	10/1/1905	10/31/1924
Obar	35.55	–103.20	4,104	1/1/1926	6/30/1968	1/1/1926	6/30/1968
Porter	35.23	–103.28	4,078	6/1/1923	4/30/1984	—	—
Quay 2 S	34.90	–103.75	4,304	5/1/1923	5/31/1959	—	—
Ragland 3 SSW	34.78	–103.75	5,060	2/1/1935	Present	5/1/1959	Present
Rinestine Ranch	35.60	–103.33	4,383	10/1/1968	10/31/1983	10/1/1968	10/31/1983
San Jon	35.11	–103.33	4,230	6/1/1907	Present	6/1/1907	Present
Tucumcari	35.17	–103.70	4,042	7/1/1909	9/30/1956	7/1/1912	8/31/1947
Tucumcari 4 NE	35.20	–103.69	4,086	12/1/1904	Present	12/1/1904	Present

Source: WRCC, 2014

— = Information not available

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

Table 5-1. Northeast New Mexico Climate Stations

Climate Stations [a]	Latitude	Longitude	Elevation	Precipitation		Temperature	
				Data Start	Data End	Data Start	Data End
Quay County (cont.)							
Tucumcari FAA Airport	35.18	–103.60	4,051	1/1/1941	Present	1/1/1948	Present
Ute Dam	35.36	–103.44	3,825	2/1/1965	Present	2/1/1965	Present
Curry County							
Clovis	34.42	–103.20	4,290	6/1/1911	10/31/2011	6/1/1911	10/31/2011
Clovis 13 N	34.60	–103.22	4,435	7/1/1949	Present	7/1/1949	Present
Frio Draw	34.67	–103.05	4,104	8/1/1951	6/30/1957	—	—
Melrose	34.43	–103.63	4,599	7/1/1908	Present	7/1/1908	Present
Pleasant Hill	34.50	–103.08	4,200	10/1/1914	9/30/1931	—	—
St Vrain	34.42	–103.50	4,452	9/1/1912	3/31/1946	—	—
Roosevelt County							
Arch	34.11	–103.17	3,940	12/1/1908	6/30/2005	4/1/1909	6/30/2005
Elida	33.94	–103.66	4,395	1/1/1910	5/31/2013	2/1/1941	5/31/2013
Floyd	34.22	–103.55	4,304	5/1/1929	12/31/1959	—	—
Portales	34.17	–103.35	4,010	1/1/1905	Present	2/1/1905	Present
Portales 7 WNW	34.23	–103.43	4,203	4/30/1934	9/30/1960	4/30/1934	9/30/1960
Richland	33.97	–103.40	4,403	6/1/1913	7/31/1947	3/1/1914	9/30/1941
Texico (Near)	34.30	–103.08	4,038	9/1/1912	6/30/1931	2/1/1925	6/30/1931
Union Valley	33.77	–103.63	4,505	6/1/1923	8/31/1958	—	—

Source: WRCC, 2014

— = Information not available

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

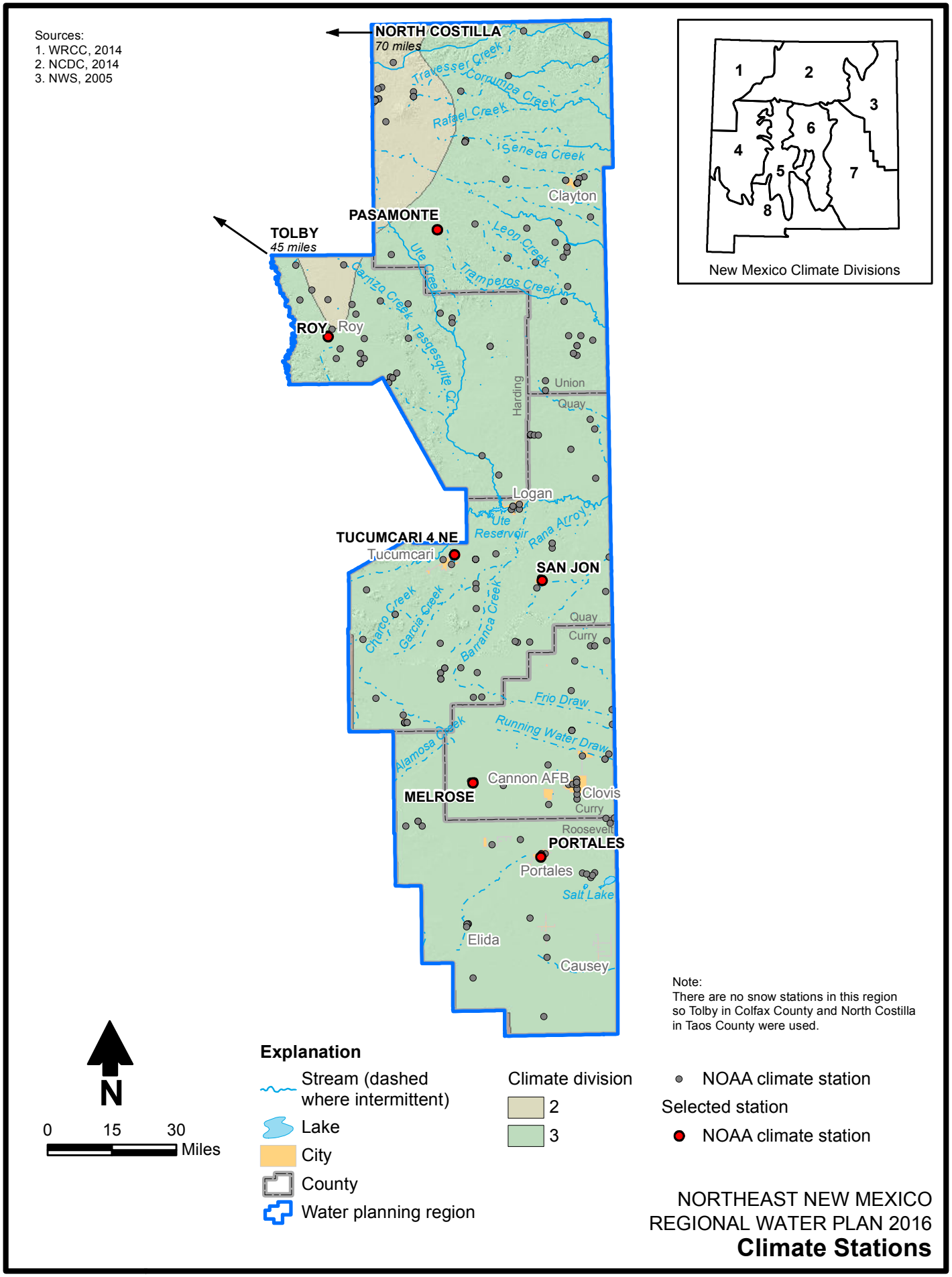

Sources:
1. WRCC, 2014
2. NCDC, 2014
3. NWS, 2005
NORTH COSTILLA
70 miles
TOLBY
45 miles
PASAMONTE
ROY
Roy
TUCUMCARI 4 NE
Tucumcari
SAN JON
MELROSE
Cannon AFB
Clovis
PORTALES
Portales
Clayton
Union
Quay
Harding
Logan
Curry
Roosevelt
Elida
Causey
Salt Lake
Ute Reservoir
Travesser Creek
Corrumpa Creek
Rafael Creek
Seneca Creek
Leon Creek
Ute Creek
Tramperos Creek
Carrizo Creek
Tesgesquite Cr.
Rana Arroyo
Charco Creek
Garcia Creek
Barranca Creek
Frio Draw
Running Water Draw
Alamosa Creek
1
2
3
4
5
6
7
8
New Mexico Climate Divisions
Note:
There are no snow stations in this region so Tolby in Colfax County and North Costilla in Taos County were used.
N
0
15
30
Miles
Explanation
Stream (dashed where intermittent)
Lake
City
County
Water planning region
Climate division
2
3
NOAA climate station
Selected station
NOAA climate station
NORTHEAST NEW MEXICO
REGIONAL WATER PLAN 2016
Climate Stations
S:\PROJECTS\WR12.0165_STATE_WATER_PLAN_2012\GIS\MXDS\FIGURES_2016\NORTHEAST_NEW_MEXICO\FIG5-1_CLIMATE_STATIONS.MXD 6/10/2016

Figure 5-1

Table 5-2. Temperature and Precipitation for Selected Climate Stations Northeast New Mexico Water Planning Region

Station Name	Precipitation (inches)				Temperature			
	Average Annual [a]	Minimum [b]	Maximum [b]	% of Possible Observations [c]	Average (°F)			% of Possible Observations [c]
					Annual [d]	Minimum [e]	Maximum [e]	
Pasamonte	15.46	5.78	34.12	95.8	51.1	35.4	66.9	62.7
Roy	15.51	6.57	33.86	94.5	52.0	37.5	66.5	57.2
San Jon	16.32	7.27	34.76	96.2	58.6	43.7	73.63	71.4
Tucumcari 4 NE	15.90	6.13	34.94	99.3	58.5	43.6	73.4	98.8
Melrose	16.02	6.78	28.07	88.2	57.7	42.4	73.0	60
Portales	16.78	7.50	44.10	96.3	58.2	42.4	74.0	75

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.

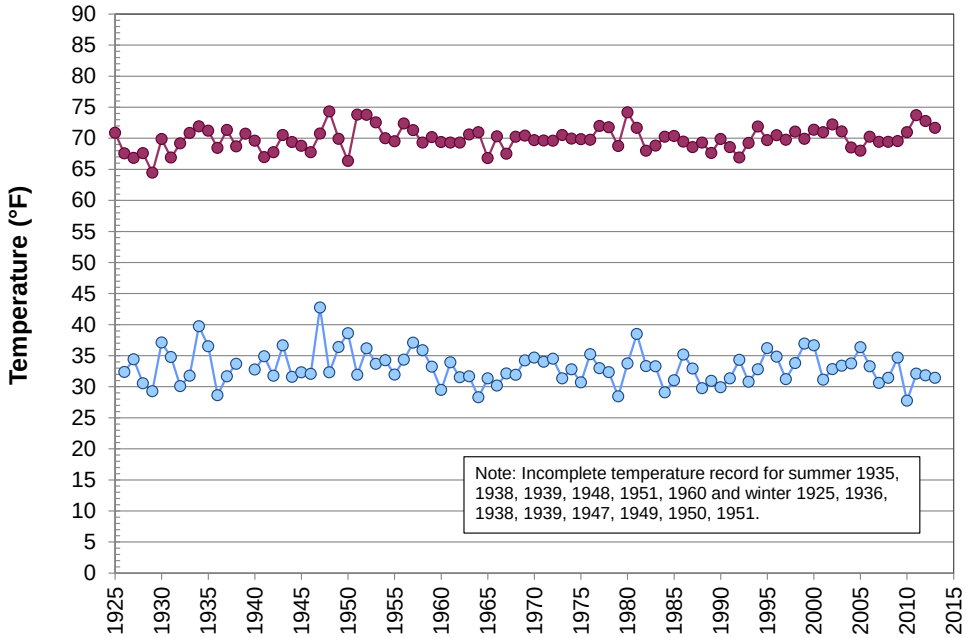
[b] Minimum and maximum recorded annual precipitation amounts for each station.

[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).

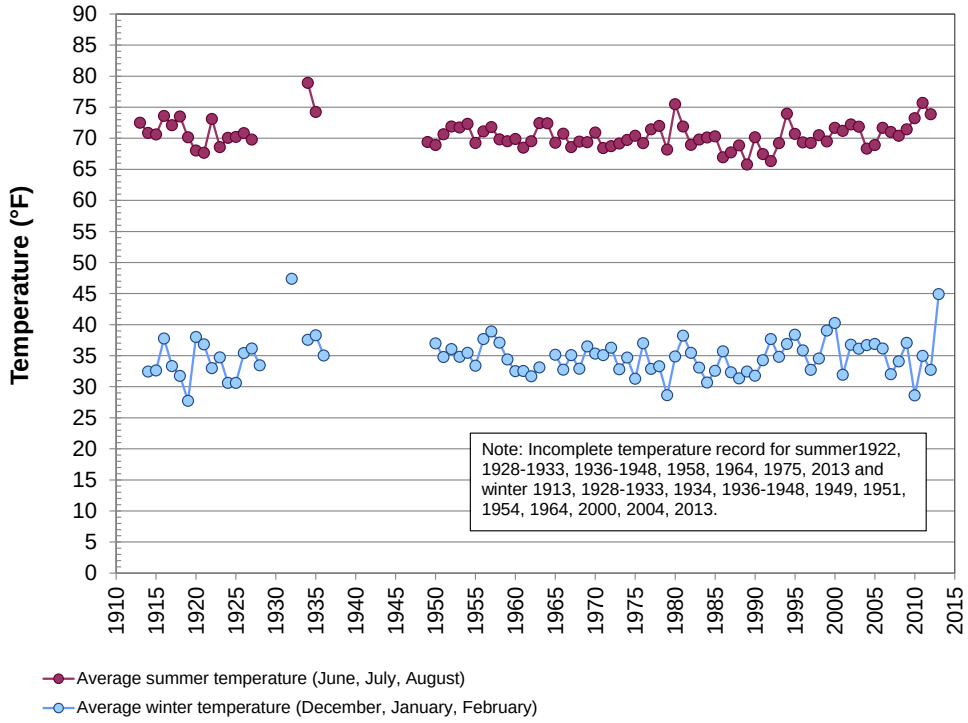
[d] Average of the daily average temperatures calculated for each station.

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

Pasamonte



Roy



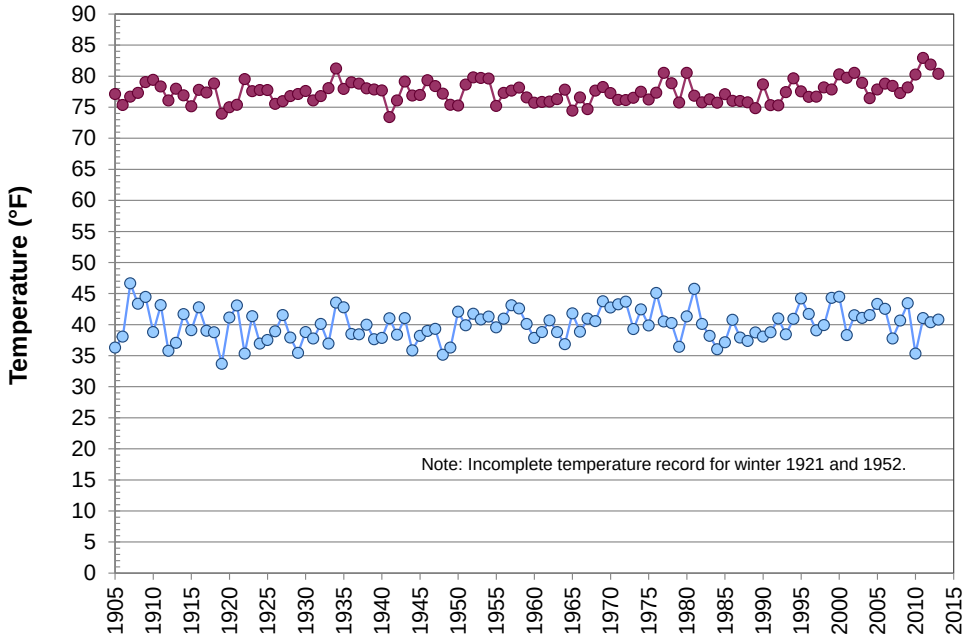
NORTHEAST NEW MEXICO
REGIONAL WATER PLAN 2016

Average Temperature
Pasamonte and Roy Climate Stations

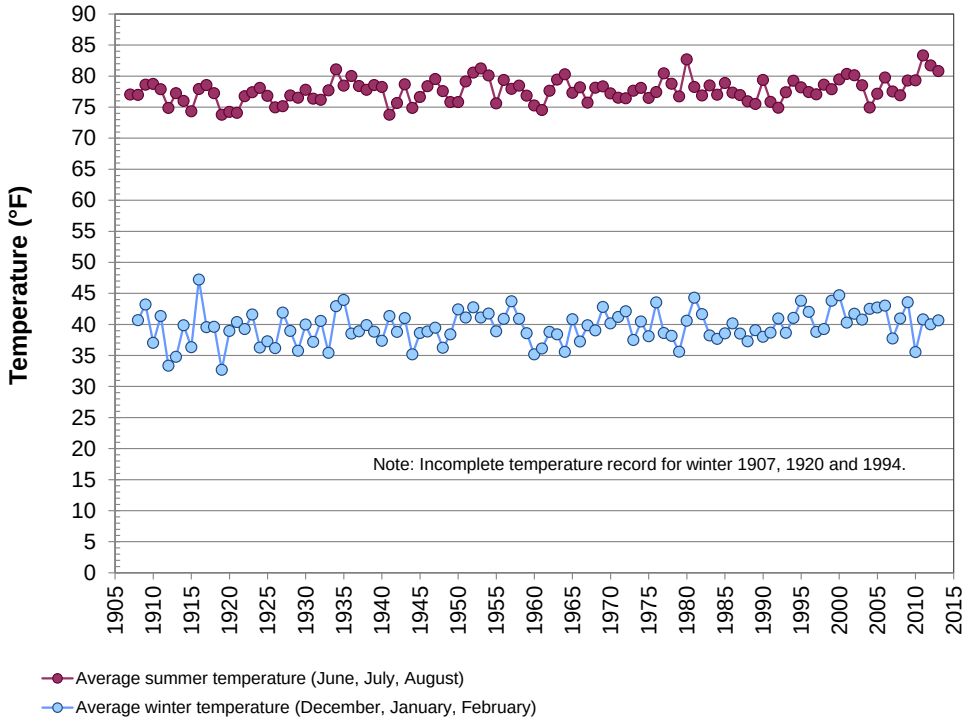
Figure 5-2a

P:_WR12-165\RWPs_2014\1_NE NM\Figures\Fig5-02a_Temp_Pasamonte-Roy.docx 9/5/16

Tucumcari 4 NE



San Jon



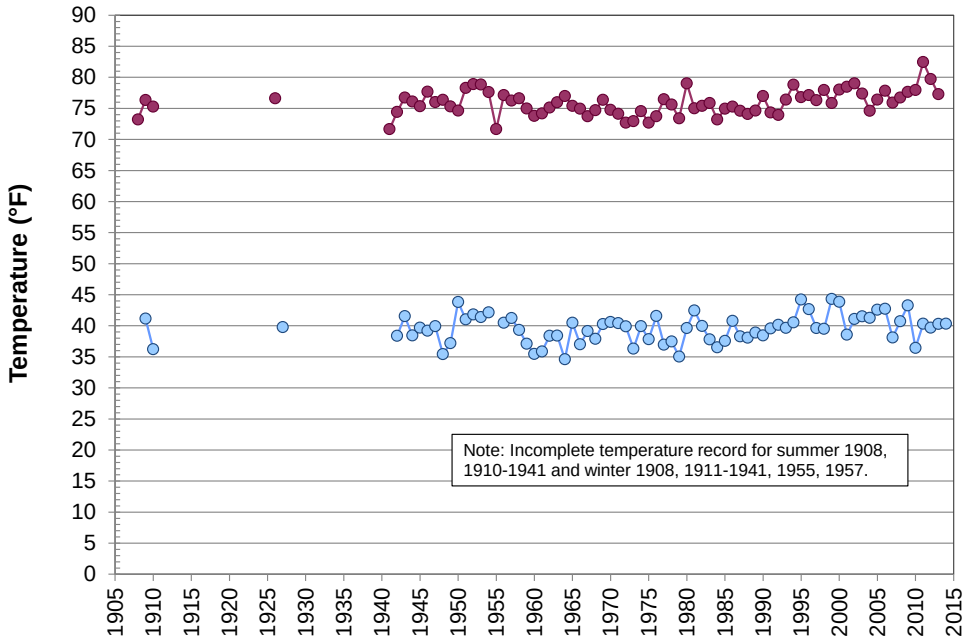
NORTHEAST NEW MEXICO
REGIONAL WATER PLAN 2016

Average Temperature
Tucumcari 4 NE and San Jon Climate Stations

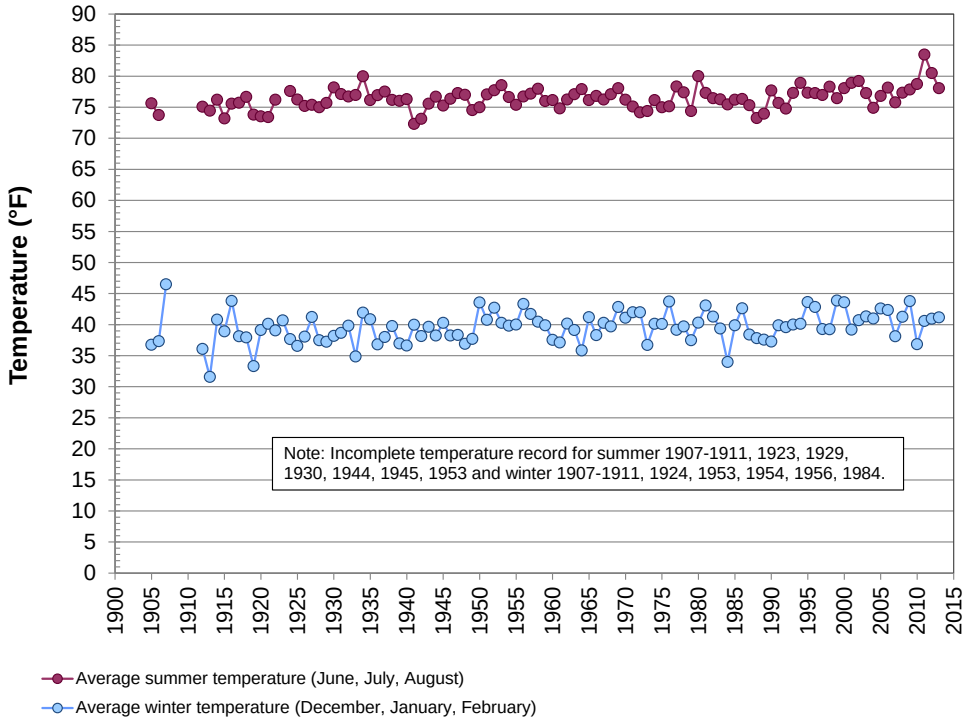
Figure 5-2b

P:_WR12-165\RWPs_2014\1_NE NM\Figures\Fig5-02b_Temp_Tucumcari 4 NE-San Jon.docx 9/5/16

Melrose



Portales

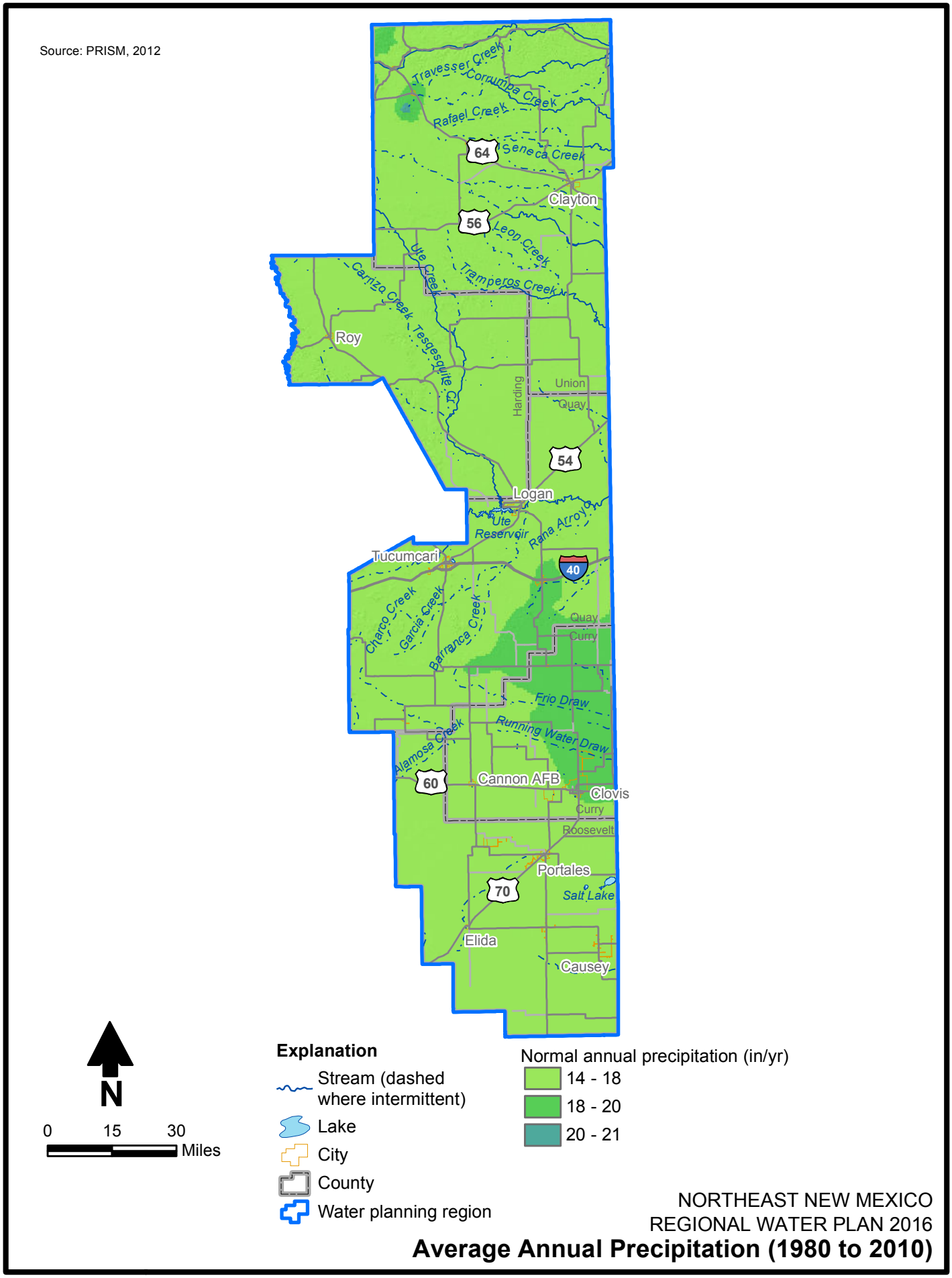


NORTHEAST NEW MEXICO
REGIONAL WATER PLAN 2016

Average Temperature
Melrose and Portales Climate Stations

Figure 5-2c

P:_WR12-165\RWPs_2014\1_NE NM\Figures\Fig5-02c_Temp_Melrose-Portales.docx 9/5/16

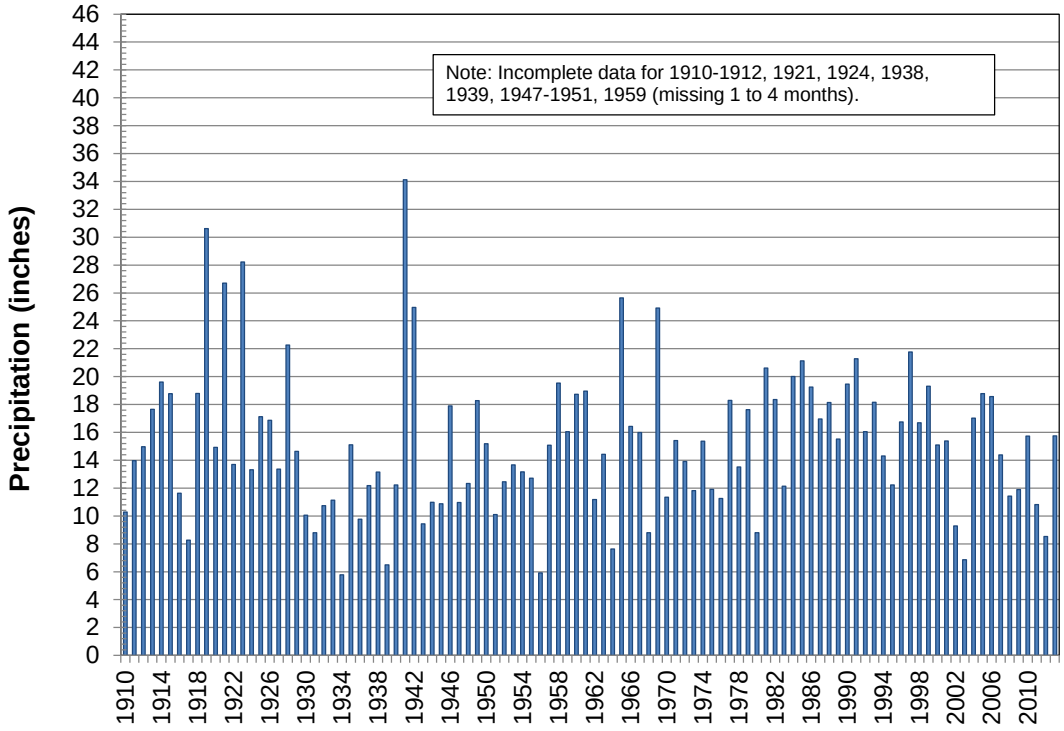


NORTHEAST NEW MEXICO
REGIONAL WATER PLAN 2016

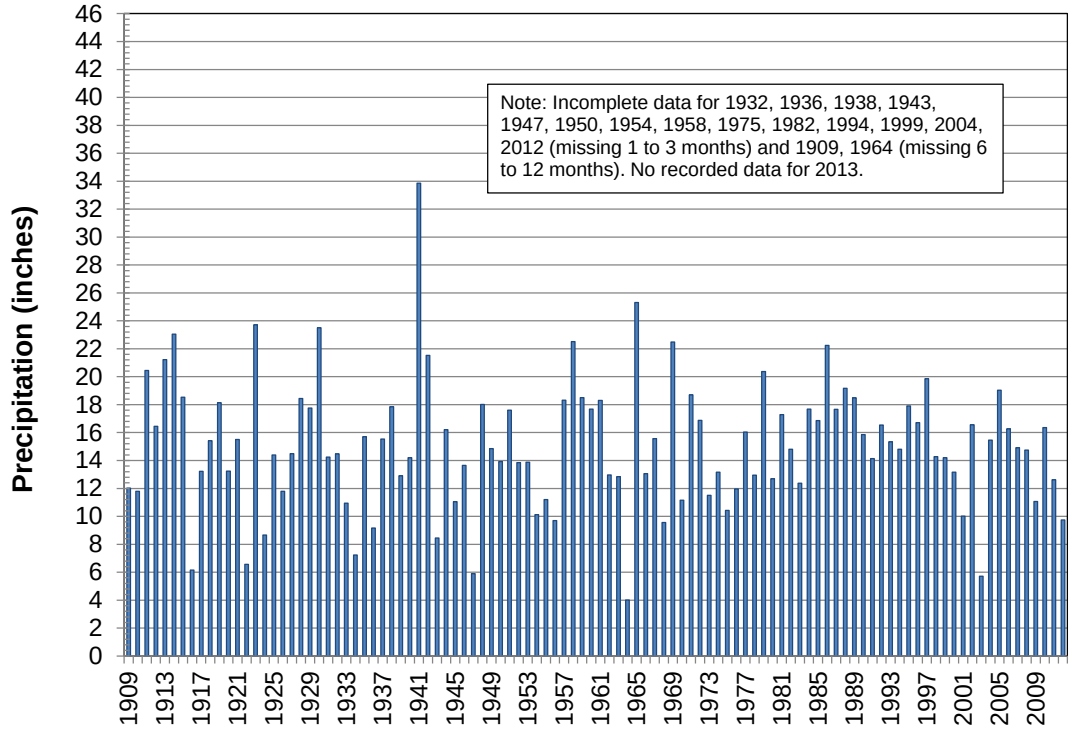
Average Annual Precipitation (1980 to 2010)

Figure 5-3

Pasamonte



Roy



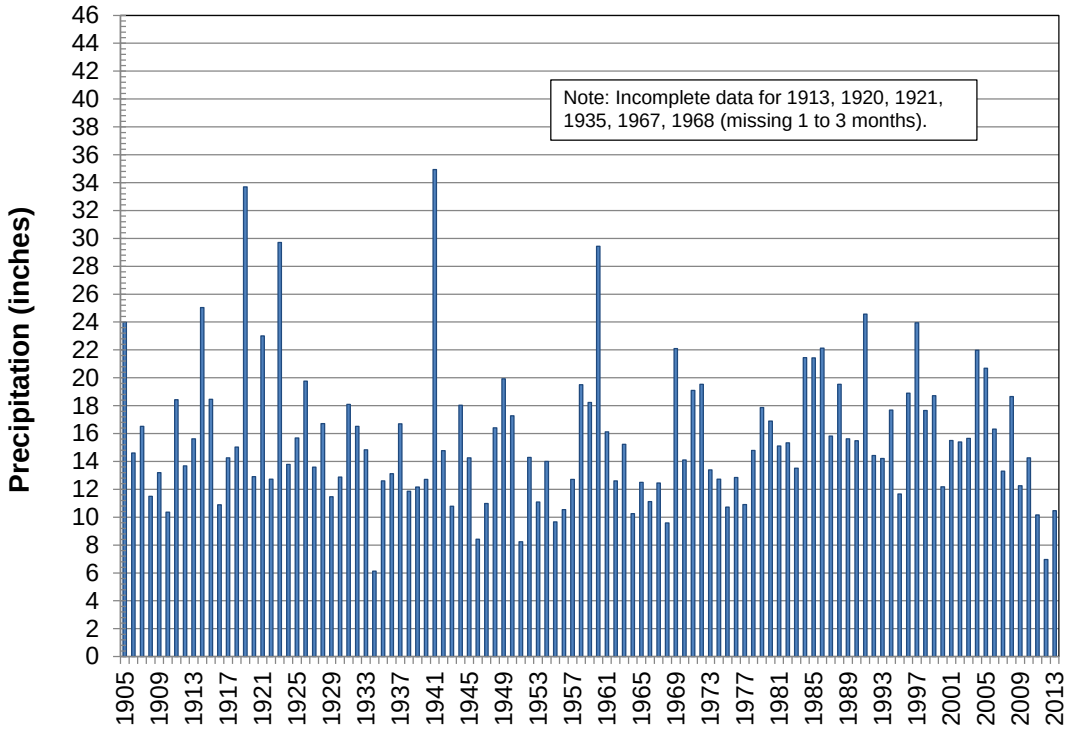
NORTHEAST NEW MEXICO
REGIONAL WATER PLAN 2016

Annual Precipitation
Pasamonte and Roy Climate Stations

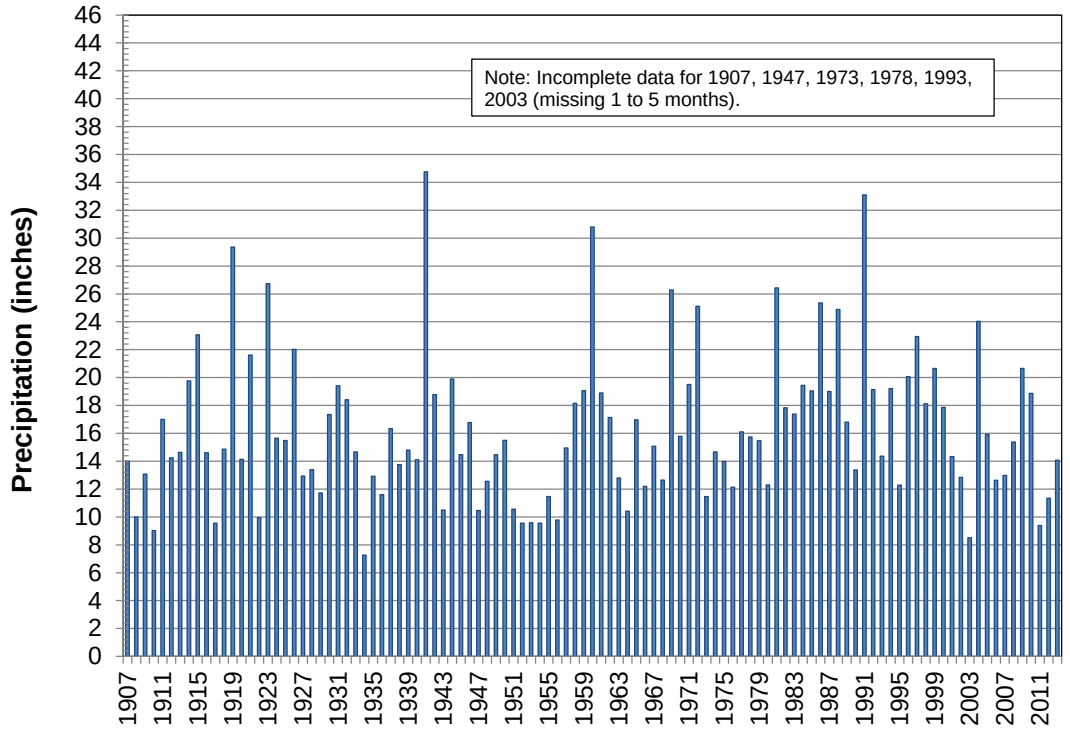
Figure 5-4a

P:_WR12-165\RWPs_2014\1_NE NM\Figures\Fig5-04a_Precip_Pasamonte-Roy.docx 6/29/16

Tucumcari 4 NE



San Jon



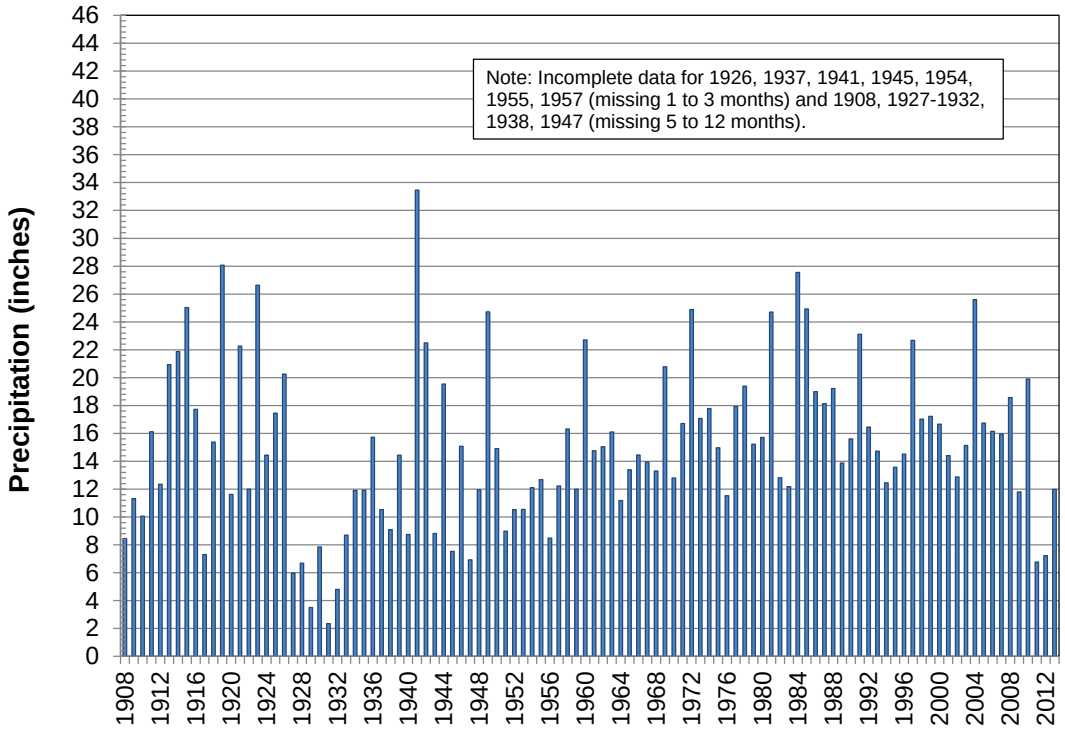
NORTHEAST NEW MEXICO
REGIONAL WATER PLAN 2016

Annual Precipitation
Tucumcari 4 NE and San Jon Climate Stations

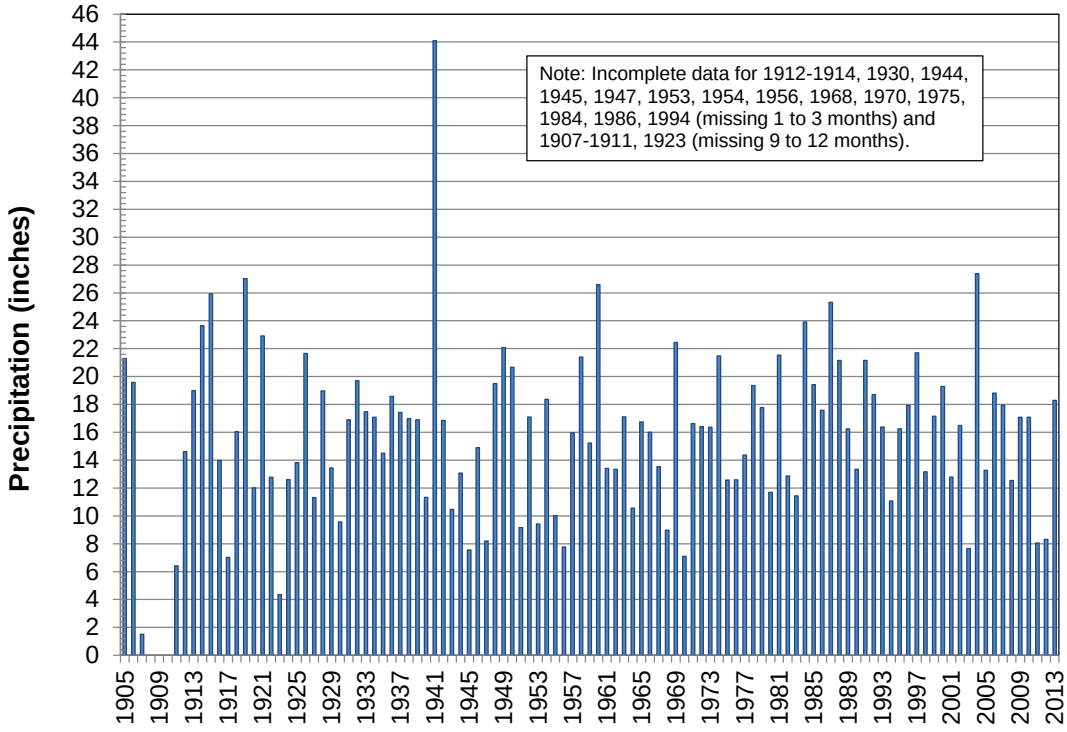
Figure 5-4b

P:_WR12-165\RWPs_2014\1_NE NM\Figures\Fig5-04b_Precip_Tucumcari 4 NE-San Jon.docx 6/29/16

Melrose



Portales



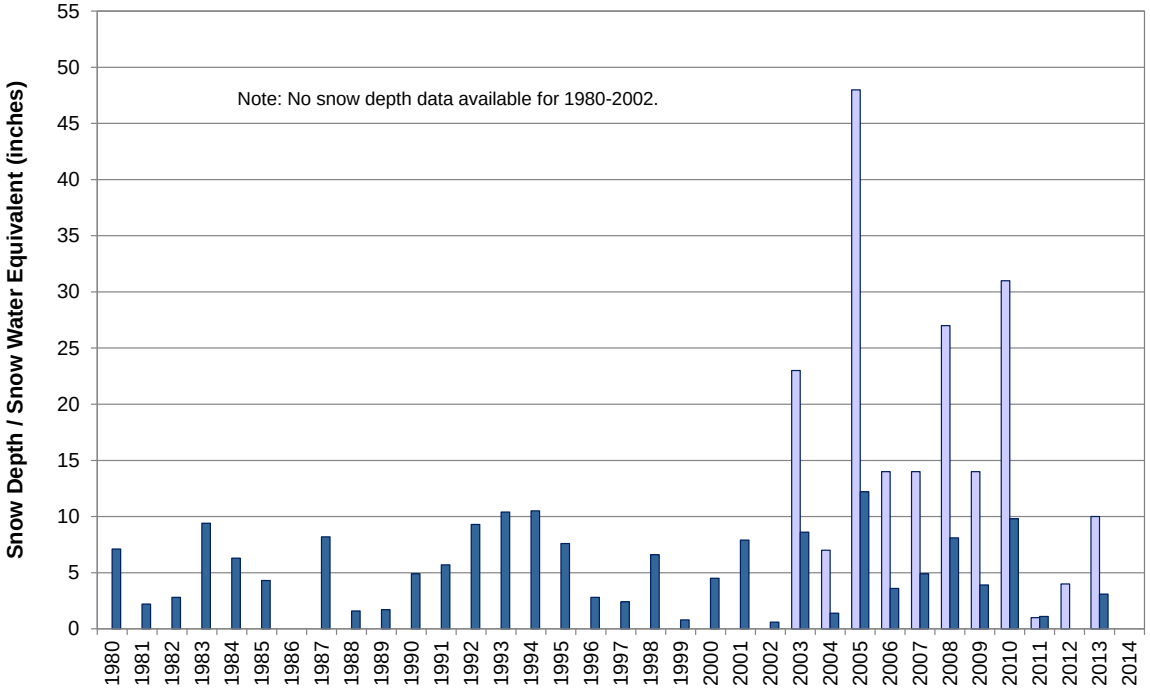
NORTHEAST NEW MEXICO
REGIONAL WATER PLAN 2016

Annual Precipitation
Melrose and Portales Climate Stations

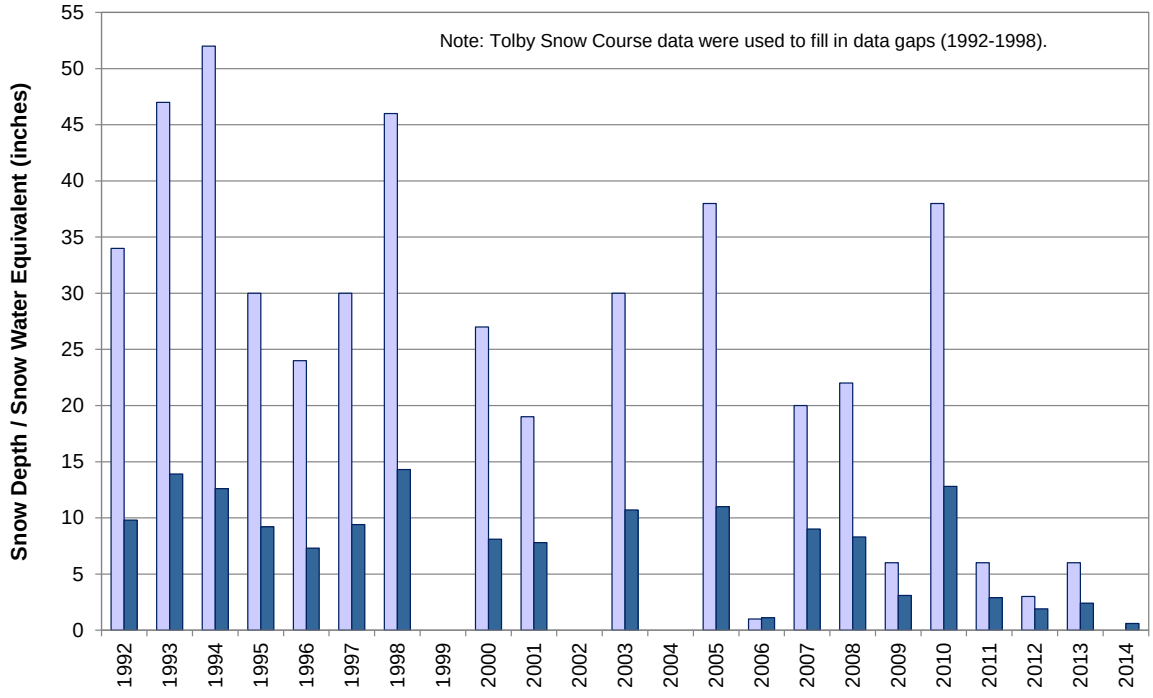
Figure 5-4c

P:_WR12-165\RWPs_2014\1_NE NM\Figures\Fig5-04c_Precip_Melrose-Portales.docx 6/29/16

North Costilla SNOTEL



Tolby SNOTEL



Snow depth

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

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

NORTHEAST NEW MEXICO
REGIONAL WATER PLAN 2016

Snow Depth and Snow Water Equivalent for April

Figure 5-5

P:_WR12-165\RWPs_2014\1_NE NM\Fig5-05_Reg 1_SNOTEL.docx 6/29/16

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 from the North Costilla and Tolby stations is provided on Figure 5-5. The figure shows that the snowpack and snow water equivalent varies greatly, from 0 to more than 50 inches.

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

Table 5-3. Palmer Drought Severity Index Classifications

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

There are considerable limitations when using the PDSI, as it may not describe rainfall and runoff that varies from location to location within a climate division and may also lag in indicating emerging droughts by several months. Also, the PDSI does not consider groundwater or reservoir storage, which can affect the availability of water supplies during drought conditions. However, even with its limitations, many states incorporate the PDSI into their

drought monitoring systems, and it provides a good indication of long-term relative variations in drought conditions, as PDSI records are available for more than 100 years.

The PDSI is calculated for climate divisions throughout the United States. Western Union and a portion of northwestern Harding counties fall within New Mexico Climate Division 2 (the Northern Mountains Climate Division) (Figure 5-1), and the rest of the Northeast New Mexico planning region falls within Division 3 (the Northeastern Plateau Climate Division). Figure 5-6 shows the long-term PDSI for these two divisions. Of interest are the large variations from year to year in both divisions, which are similar in pattern though not necessarily in magnitude.

The chronological history of drought, as illustrated by the PDSI, indicates that the most severe droughts in the last century occurred in the early 1900s, the 1930s, the 1950s, the early 2000s, and in recent years (2011 to 2015) (Figure 5-6). In 2013, the PDSI in Climate Division 2, which covers the headwaters of the Pecos and Canadian rivers, dipped to its lowest index value in almost 50 years (Figure 5-6).

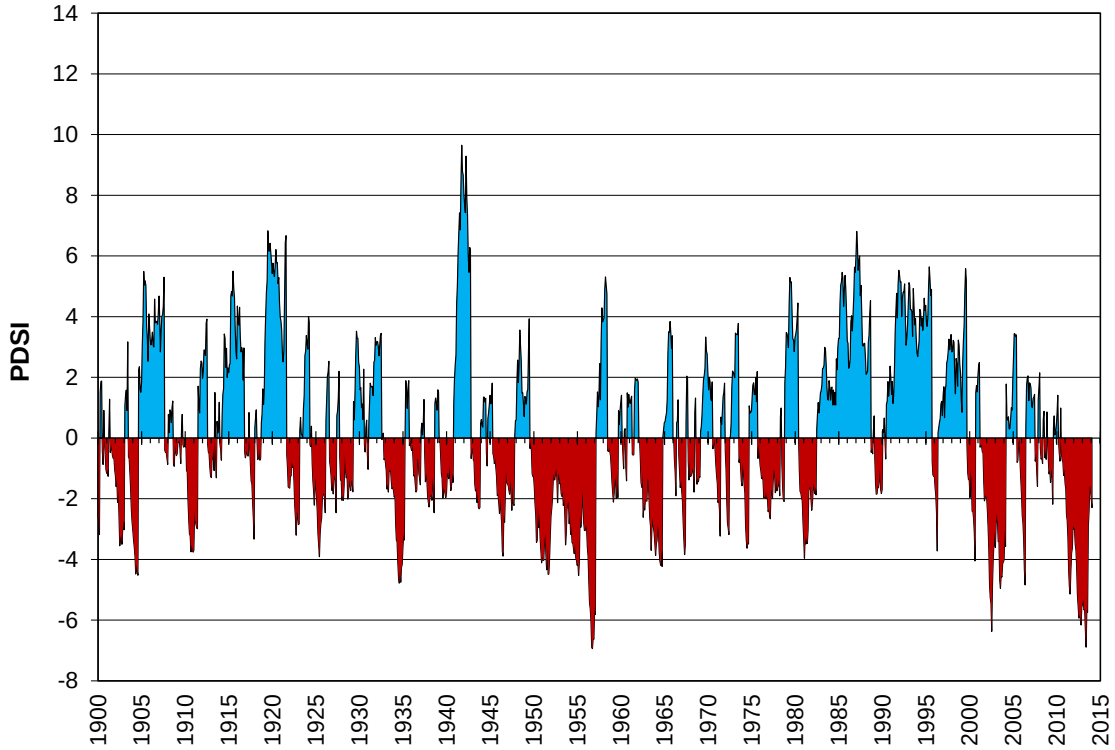
The likelihood of drought conditions developing in New Mexico is influenced by several weather patterns:

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

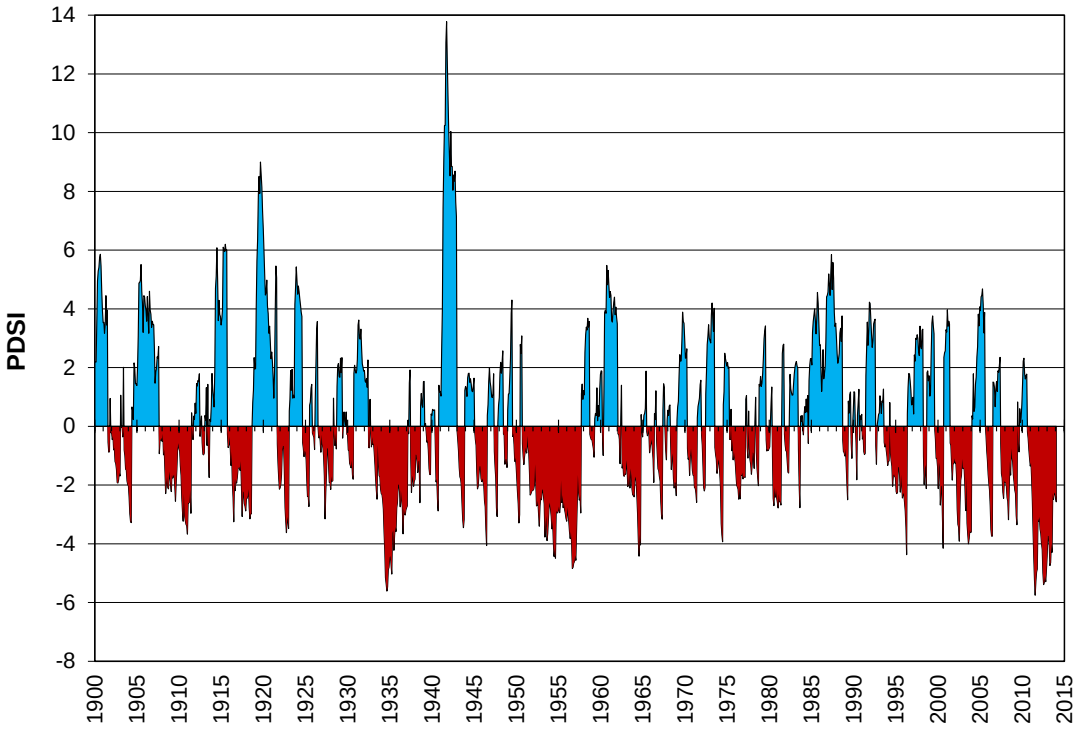
- *The Pacific Decadal Oscillation (PDO):* The PDO is a multi-decadal pattern of climate variability caused by shifting sea surface temperatures between the eastern and western Pacific Ocean that cycle approximately every 20 to 30 years. Warm phases of the PDO (shown as positive numbers on the PDO index)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

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

Climate Division 2



Climate Division 3



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

NORTHEAST NEW MEXICO
REGIONAL WATER PLAN 2016

Palmer Drought Severity Index
New Mexico Climate Divisions 2 and 3

Figure 5-6

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- *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 projected frequency and severity of flooding.
- Streamflows in major rivers across the Southwest are projected to decrease substantially during this century (e.g., Christensen et al., 2004; Hurd and Coonrod, 2008; USBR, 2011, 2013) due to a combination of diminished cold season snowpack in headwaters regions and higher evapotranspiration in the warm season. The seasonal distribution of streamflow is projected to change as well: flows could be somewhat higher than at present in late winter, but peak runoff will occur earlier and be diminished. Late spring/early summer flows are projected to be much lower than at present, given the combined effects of less snow, earlier melting, and higher evaporation rates after snowmelt.

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.

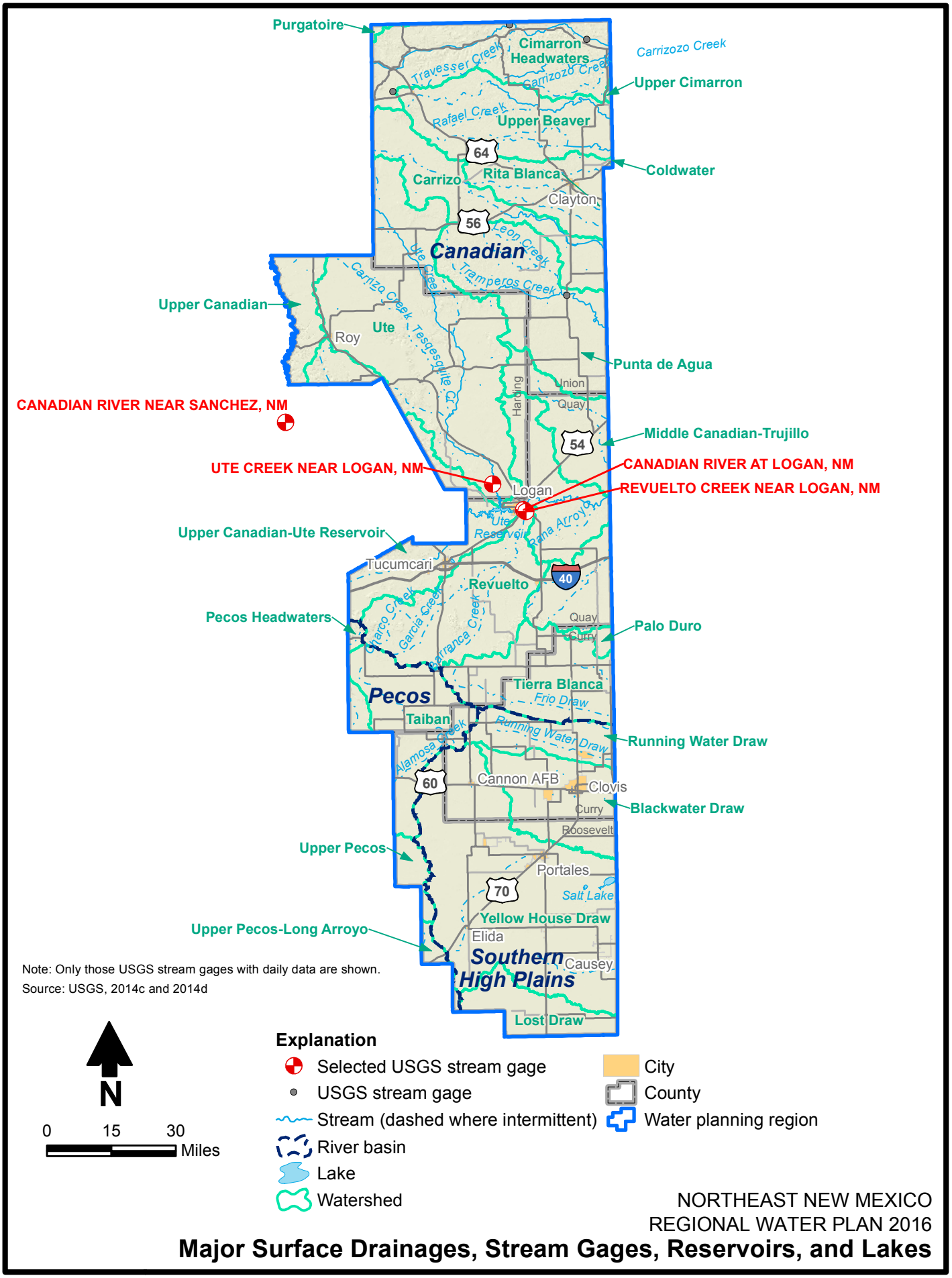
5.2 Surface Water Resources

In the year 2010 surface water supplied approximately 13 percent of all water diversions in the Northeast New Mexico Water Planning Region, with its primary uses being for irrigated agriculture and reservoir evaporation. The dominant waterway flowing in the region is the Canadian River and its tributaries. The northern portion of Union County is within the Dry Cimarron Basin, and some portions of the area along the western boundary of the planning area (western Quay, Curry, and Roosevelt counties) are within the Pecos River Basin. The southern portion of the planning region (south-central Quay County and Curry and Roosevelt counties) is located within the Southern High Plains basin, where there are no perennial surface water features. Major surface drainages (including both perennial and intermittent streams) and watersheds in the planning region are shown on Figure 5-7.

When evaluating surface water information, it is important to note that streamflow does not represent available supply, as there are also water rights and interstate compact limitations. The administrative water supply discussed in Section 5.5 is intended to represent supply considering both physical and legal limitations, but excluding potential compact limitations. The information provided in this section is intended to illustrate the variability and magnitude of streamflow, and particularly the relative magnitude of streamflow in recent years.

Tributary flow is not monitored in every subwatershed in the planning region. However, streamflow data are collected by the U.S. Geological Survey (USGS) and various cooperating agencies at several stream gage sites in the planning region. Table 5-4a lists the locations and periods of record for data collected at stream gages in the region, as well as the drainage area and estimated irrigated acreage for surface water diversions upstream of the station. Table 5-4b provides the minimum, median, and maximum annual yield for all gages that have 10 or more years of record. In addition to the large variability in annual yield, streamflow also varies from month to month within a year, and monthly variability or short-term storms can have flooding impacts, even when annual yields are low. Table 5-5 provides monthly summary statistics for each of the stations with 10 or more years of record.

For this water planning update, three stream gages, shown on Figure 5-8, were analyzed in more detail. These stations were chosen because of their locations in the hydrologic system, completeness of record, and representativeness as key sources of supply. Figure 5-8 shows the minimum and median annual water yield for these gages. Figures 5-9a and 5-9b show the annual water yield from the beginning of the period of record through 2012 for the three gages. As shown in these figures, streamflow varies greatly from year to year, with the highest-flow years supplying many times more water than the drier years. The exceptionally low flows in 2011 and 2012 can be observed on Figures 5-9a and 5-9b.



NORTHEAST NEW MEXICO
REGIONAL WATER PLAN 2016

Major Surface Drainages, Stream Gages, Reservoirs, and Lakes

Figure 5-7

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Table 5-4a. USGS Stream Gage Stations

USGS Station [a]							Period of Record	
Name [b]	Number	Latitude	Longitude	Elevation (ft amsl)	Drainage Area (sq mi)	Irrigated Upstream Land [c] (acres)	Start Date	End Date
San Miguel County								
Canadian River Near Sanchez, NM [d]	07221500	35.6548333	−104.378611	4,500	6,015	56,000	10/1/1912	Present
Union County								
Bennett Spring Nr Capulin, NM	07153410	36.7678025	–103.917468	—	—	NA	7/12/1977	10/14/1981
Dry Cimarron R Nr Guy, NM	07153500	36.9875204	–103.42411	4,900	500	NA	10/1/1942	12/31/1973
Cimarron R Nr Folsom, NM	07154000	36.934743	–103.0991	4,600	895	NA	10/1/1927	9/30/1933
Tramperos Creek Near Stead, NM	07227200	36.0708333	–103.203333	4,481	556	NA	6/17/1966	12/31/1973
Harding County								
Ute Creek Near Logan, NM	07226500	35.4385278	–103.525794	3,820	2,060	Few hundred acres	1/1/1942	6/25/2013
Canadian River Near Roy, NM	07214000	35.9194805	–104.353315	4,893	4,066	—	4/1/1936	9/30/1965
Quay County								
Canadian River at Logan, NM	07227000	35.35	–103.399722	3,667	11,141	90, 000	1/1/1909	Present
Revuelto Creek Near Logan, NM	07227100	35.3443861	–103.389606	3,660	786	NA	8/1/1959	Present

Source: USGS, 2014c (unless otherwise noted)

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

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

[c] Source: DBS&A, 2007; USGS, 2014a

[d] Although outside the planning region, this station yields the most appropriate data for streamflow entering the region (in Harding County).

USGS = U.S. Geological Survey
ft amsl = Feet above mean sea level
sq mi = Square miles

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

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

USGS Station Name [a]	Annual Yield [b] (acre-feet)			Number of Years [c]
	Minimum	Median	Maximum	
San Miguel County				
Canadian River Near Sanchez, NM [d]	1,955	80,071	833,286	77
Union County				
Dry Cimarron R Nr Guy, NM	3,866	6,501	24,687	15
Harding County				
Ute Creek Near Logan, NM	152	8,760	62,623	71
Canadian River Near Roy, NM	13,755	54,587	546,450	21
Quay County				
Canadian River at Logan, NM	927	8,579	143,780	50
Revuelto Creek Near Logan, NM	3,461	24,470	160,938	53

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

[d] Although outside the planning region, this station yields the most appropriate data for streamflow entering the region (in Harding County).

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
San Miguel County													
Canadian River near Sanchez, NM [d]	77	2,998	3,206	3,497	11,377	22,761	19,779	12,591	17,549	12,823	5,704	3,193	2,839
Union County													
Dry Cimarron R Nr Guy, NM	15	314	262	261	416	1,893	1,020	1,191	2,180	437	734	299	314
Harding County													
Ute Creek Near Logan, NM	71	132	101	104	521	1,928	1,470	2,894	4,196	1,673	562	159	91
Canadian River Near Roy, NM	21	1,476	1,849	1,639	12,888	22,664	11,666	10,177	13,654	14,627	5,478	1,966	1,489
Quay County													
Canadian River at Logan, NM	50	382	679	532	807	2,427	2,950	3,952	5,017	4,907	1,364	1,124	360
Revuelto Creek Near Logan, NM	53	317	399	536	1,427	2,378	4,001	6,260	6,661	3,683	2,134	528	506

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.

[d] Although outside the planning region, this station yields the most appropriate data for streamflow entering the region (in Harding County).

USGS = U.S. Geological Survey

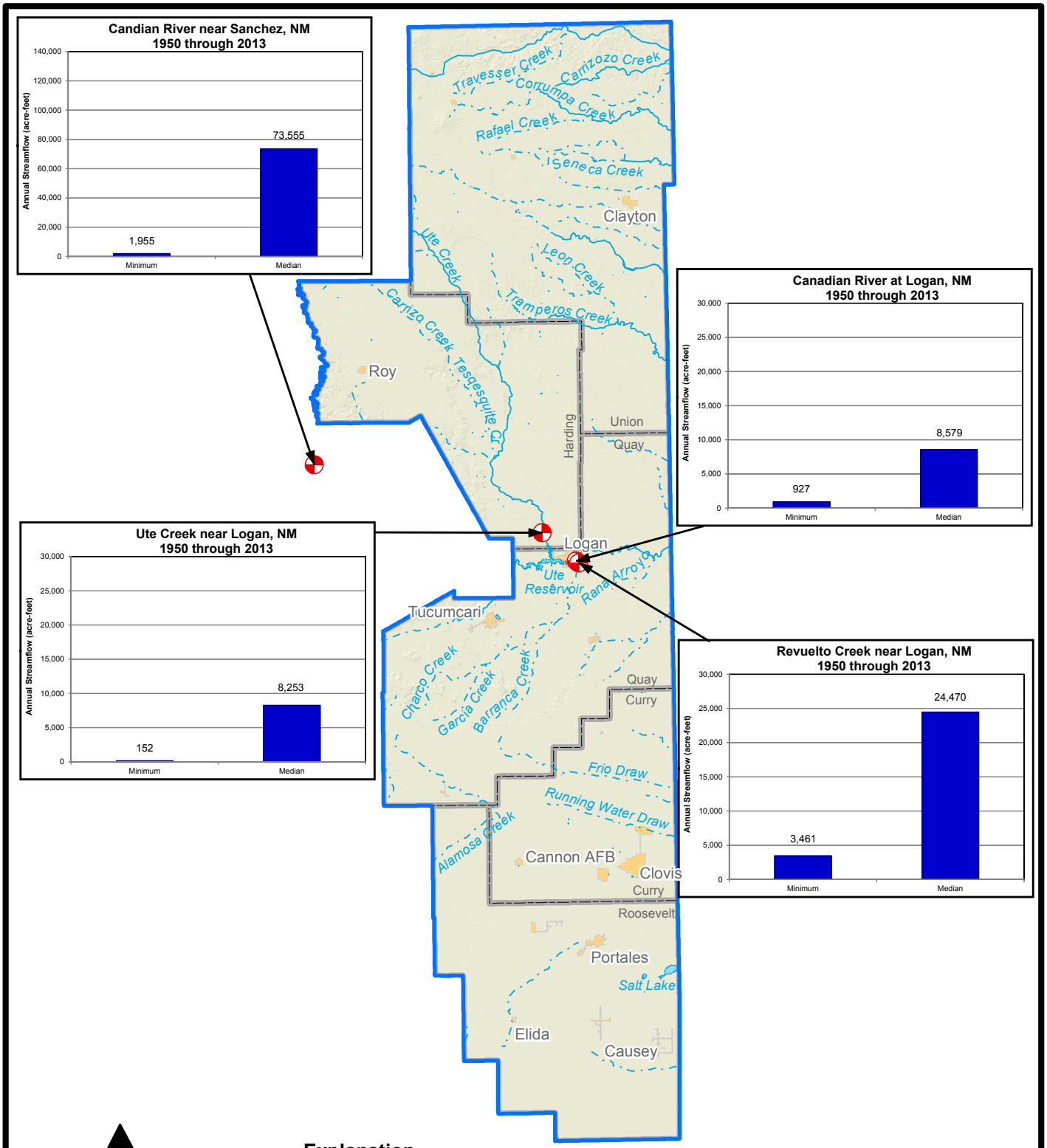

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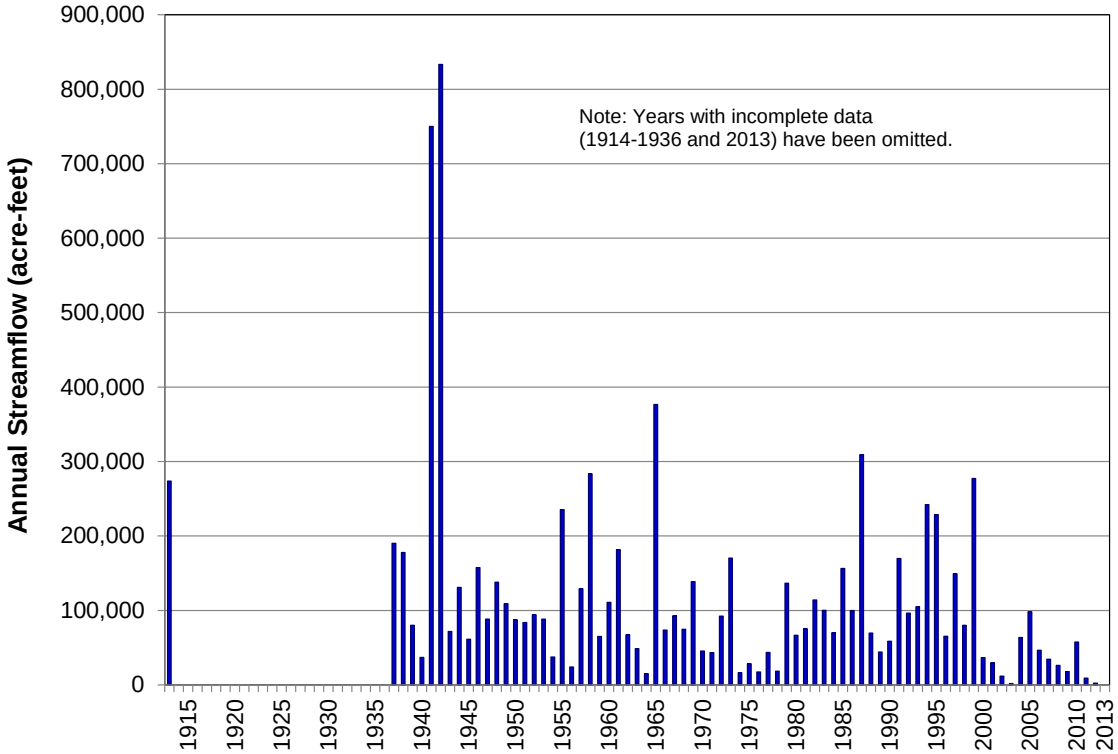
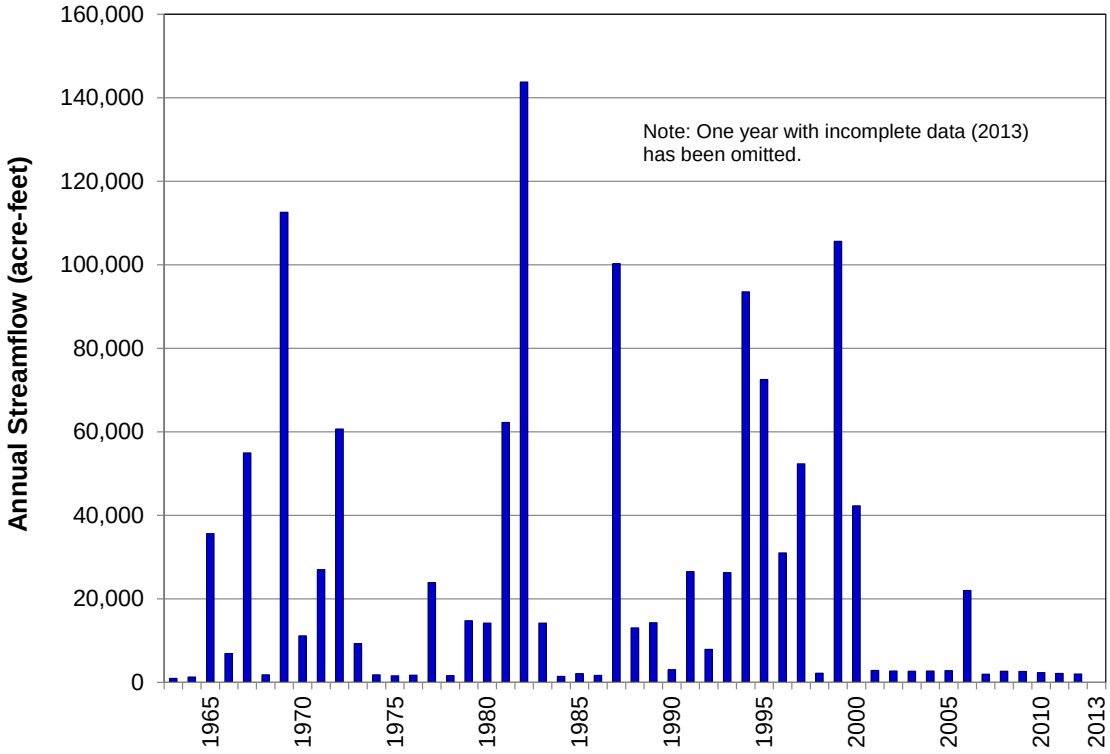
Figure 5-8

Canadian River near Sanchez, NM



Canadian River at Logan, NM



NORTHEAST NEW MEXICO
REGIONAL WATER PLAN 2016

Annual Streamflow for
Selected Gaging Stations on the Canadian River

Figure 5-9a

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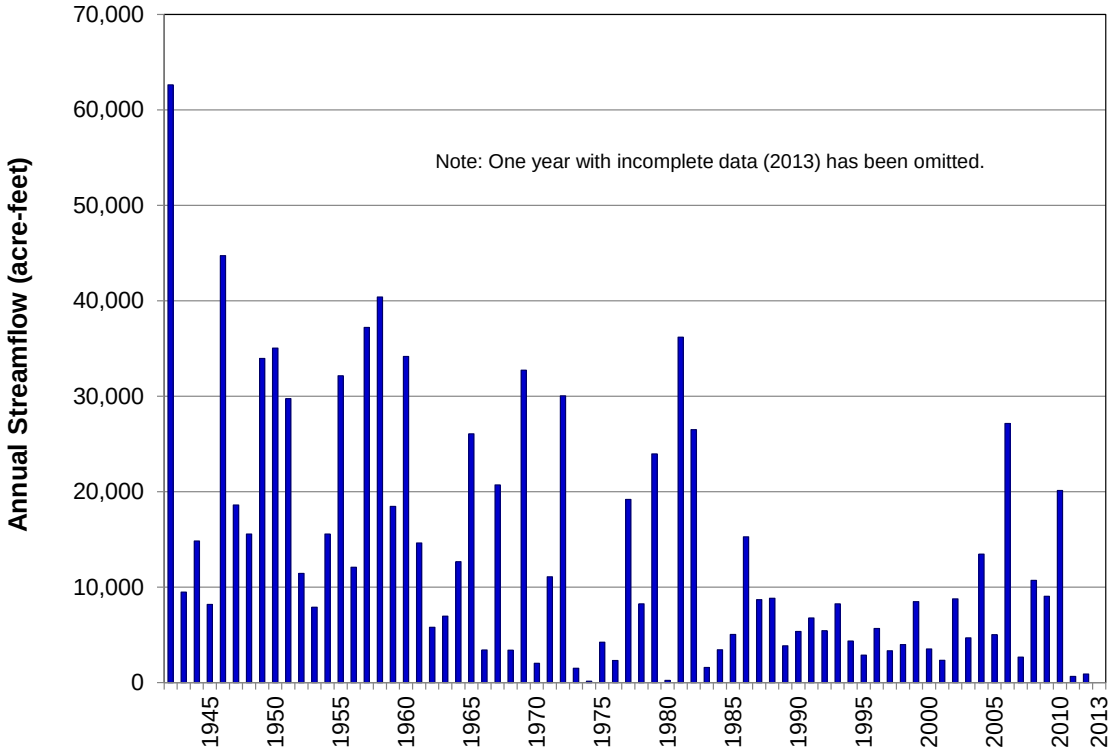
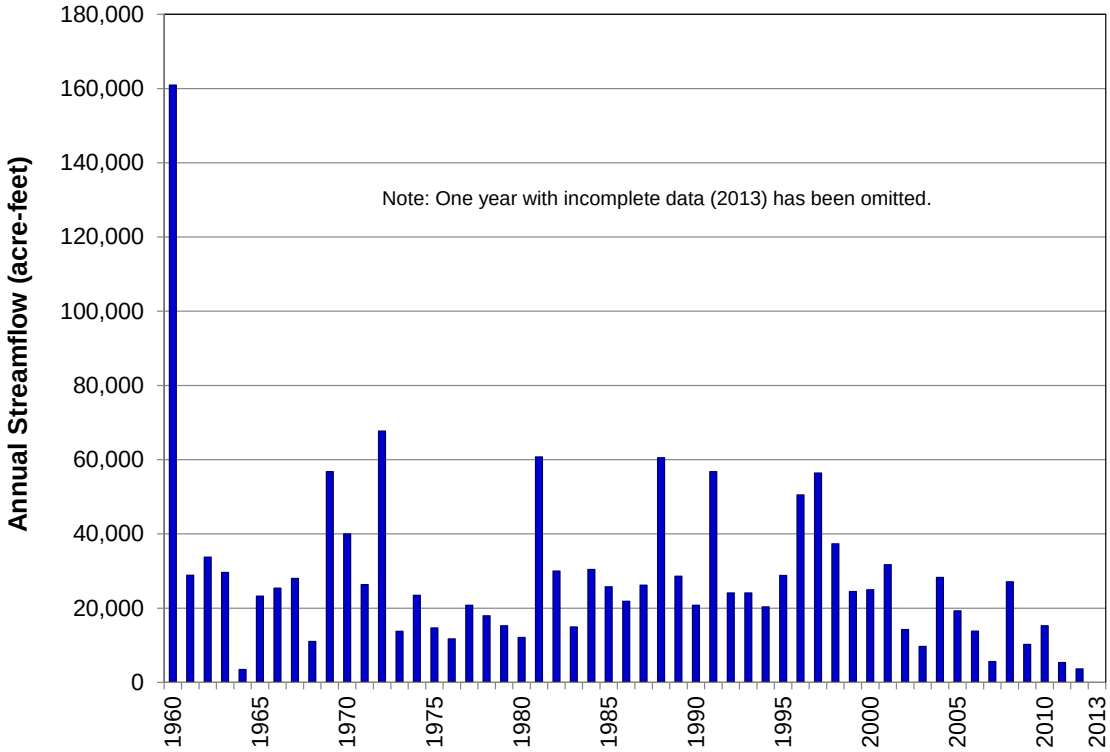
Ute Creek near Logan, NM



Revuelto Creek near Logan, NM



NORTHEAST NEW MEXICO
REGIONAL WATER PLAN 2016

Annual Streamflow for
Selected Gaging Station on Ute and Revuelto Creeks

Figure 5-9b

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In addition to the large variability in annual yield, streamflow also varies from month to month within a year, and monthly variability or short-term storms can have flooding impacts, even when annual yields are low. The accepted plan showed the variability in monthly flows, with peak flows occurring during the April-May snowmelt and August-September monsoon season (DBS&A, 2007, Appendix D2). After these runoff peaks, a period of low or base flows occurs, primarily during October through March. Recent analysis of climate trends (Gutzler, 2013) indicated that prior to 2000 a greater percentage of flow occurred in May and June and less in March and April than in more recent years, a possible indication of a trend in earlier snowmelt since 2000.

Several lakes and reservoirs are present in the planning region (Figure 5-7). Table 5-6 summarizes the characteristics of the larger lakes and reservoirs (i.e., storage capacity greater than 5,000 acre-feet, as reported in the *New Mexico Water Use by Categories 2010* report [Longworth et al., 2013]). As indicated on Table 5-6, the largest reservoir in the Northeast New Mexico planning region is Ute Reservoir, which is owned and operated by the NMISC. Plans to begin using water from the reservoir for municipal and industrial use are under development.

On March 1, 1997 the NMISC entered into a contractual agreement with the Ute Reservoir Water Commission to provide up to 24,000 acre-feet per year of water from Ute Reservoir. The Ute Reservoir Water Commission, which was formed by a joint powers agreement (JPA) in 1996 to serve as a viable organization for the planning, development, and acquisition of water from Ute Reservoir, allocated this water to its member entities for municipal and industrial supply as follows:

- City of Clovis (12,292 acre-feet) (including Cannon AFB, which has a long-term lease agreement with the City of Clovis for a portion of the City's reservation)
- Curry County (100 acre-feet)
- Village of Elida (50 acre-feet)
- Village of Grady (75 acre-feet)
- Village of Melrose (250 acre-feet)
- City of Portales (3,333 acre-feet)
- Roosevelt County (100 acre-feet)
- Village of Texico (250 acre-feet)
- Quay County (1,000 acre-feet)
- Tucumcari (6,000 acre-feet)
- Logan (400 acre-feet)
- San Jon (150 acre-feet)

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

River	Reservoir	Primary Purpose	Operator	Date Completed	Total Storage Capacity (acre-feet)	Surface Area (acres)	Dam Height (feet)	Dam Length (feet)
Union County								
Cimarron River	Clayton Lake	Recreation	New Mexico Department of Game and Fish	1955	6,900	175	82	720
Quay County								
Canadian River	Ute Reservoir (called Ute Dam in previous water plan)	Water supply	New Mexico Interstate Stream Commission	1963	403,000	7,200	132	6,570

Source: USACE, 1999

The counties of Curry and Roosevelt, the cities of Clovis and Portales, the villages of Elida, Grady, Melrose, and Texico will be served by the Eastern New Mexico Rural Water Supply (ENMRWS) project, which will consist of a pipeline from Ute Reservoir to these entities.

The Arch Hurley Conservancy District is located in Quay County, and it uses water from Conchas Reservoir, which is located on the Canadian River in the Mora-San Miguel-Guadalupe planning region, upstream of the Northeast New Mexico planning region. Water supply for the District has been compromised by the ongoing drought, and it received water for irrigation in 2014 for the first time in three years.

In addition to the reservoirs shown in Table 5-6, several smaller lakes and reservoirs are present in the region; information on these smaller reservoirs was included in the accepted plan (DBS&A, 2007). Many of these other lakes and reservoirs in the planning region, some of which are privately held, do not provide storage opportunities for most water users in the region.

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 NMOSE. 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 ENMWUA anticipates completing construction of the ENMRWS project within the next ten years. The ENMWUA intake will supply both the ENMRWS project and the Quay County diversions, although Quay County would like to install their own intake structure (a temporary Ute Reservoir intake structure is currently being used to provide water for the golf course at the Ute Lake Ranch subdivision).

A draft Ute Reservoir drought management plan was published in 2013, outlining changes in reservoir withdrawal operations that could occur with decreasing reservoir water level elevations (GeoSystems Analysis et al., 2013). The New Mexico Game and Fish conservation pool is set at 3,741.6 ft amsl, so no diversions will occur at or below that elevation. The plan calls for reductions in diversions as the reservoir elevation approaches the New Mexico Game and Fish conservation pool elevation.

5.3 Groundwater Resources

Groundwater accounted for about 87 percent of all water diversions in the year 2010 (Longworth et al., 2013), including providing water supply to all of the 63 public drinking water systems in the region (NMED, 2014c).

Table 5-7. Dams with Dam Safety Deficiency Rankings

Dam	Condition Assess-ment [a]	Deficiency	Hazard Potential [b]	Estimated Cost to Repair ($)
Union County				
Brown Reservoir Dam	Poor	Spillway capacity ~69% of required flood Unauthorized alter of spillway	Low	2,500,000
Clayton Dam	Poor	Spillway capacity 30% of required flood Seepage at downstream toe Woody vegetation Lack of design information	Low	3,000,000
Eklund Storage Works Dam	Poor	Outlet inoperable Woody vegetation Erosion on crest	Low	200,000
Gardner Dam	Poor	Spillway capacity 37% of required flood Lack of design information	Low	2,500,000
Howard Robertson Dam	Poor	Severe erosion of embankment Conduit plugged Lack of maintenance	Low	100,000
Poling Erosion Control Dam	Poor	Spillway capacity 5% of required flood	Low	2,500,000
Poling Irrigation System Dam	Poor	Woody vegetation Inoperable outlet intake - buried in sediment Maintenance needed	Low	100,000
Smithson Reservoir No. 1	Poor	Spillway capacity < 20% of required flood	Low	2,500,000
Smithson Reservoir No. 3	Poor	Spillway capacity < 7% of required flood	Low	2,500,000
Smithson Reservoir No. 4	Poor	Spillway capacity < 5% of required flood	Low	2,500,000
Snyder Lake Dam	Poor	Spillway capacity <20% of required flood	Low	2,500,000
Tramperos Creek Site 1 Dam	Fair	Lack of design information	Low	100,000
Weatherly Reservoir Dam	Poor	Lack of design information	Low	100,000
Harding County				
Abbott Lake Lower Dam	Poor	Spillway capacity 15% of required flood Lack of design information	Low	2,500,000
Abbott Lake Upper Dam	Poor	Spillway capacity <10% of required flood Lack of design information	Low	2,500,000

Source: NMOSE, 2014b

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

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

PMF = Probable maximum flood

Table 5-7. Dams with Dam Safety Deficiency Rankings

Dam	Condition Assess-ment [a]	Deficiency	Hazard Potential [b]	Estimated Cost to Repair ($)
Quay County				
Hittson Creek Dam	Poor	Spillway capacity unknown Unauthorized change Woody vegetation Unpermitted saddle dam	Low	2,500,000
Curry County				
Clovis Wastewater Lagoon Expansion Dam	Fair	Erosion on embankment outslopes Void under liner	Low	50,000
Ingram Lake Dam	Poor	Lack of design information	Significant	100,000
Running Water Draw Site 1 Dam	Poor	Lack of design information	Significant	200,000

[a] Condition assessment:

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

[b] Hazard Potential Classifications:

Significant: Dams where failure or mis-operation would likely not result in loss of human life but could cause economic loss, environmental damage, disruption of lifeline facilities, or could impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but may be located in populated areas with significant infrastructure.

Low: Dams where failure or mis-operation would likely not result in loss of life but may result in minimal economic or environmental losses. Losses would be principally limited to the dam owner's property

5.3.1 Regional Hydrogeology

The geology that controls groundwater occurrence and movement within the planning region was described in the accepted *Northeast New Mexico Regional Water Plan* (DBS&A, 2007), based on studies by Baldwin and Bushman (1957), Trauger and Bushman (1964), Berkstresser and Mourant (1966), Cooper and Davis (1967), Lansford et al. (1982), Gutentag et al. (1984), Luckey et al. (1986, 1988), Weeks et al. (1988), Broadhead (1987), Kilmer (1987), Trauger and Churan (1987), Gustavson (1996), Wood (2000), Blandford et al. (2003), and Dutton et al. (2001). 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 (NMBGMR, 2003), is included as Figure 5-10.

The Northeast New Mexico water planning region falls entirely in the Great Plains physiographic province, which lies between the Rocky Mountains to the west and the Central Lowland on the east. The planning region falls into four sections of the Great Plains province: the Llano Estacado, Raton, and Upper and Lower Pecos sections.

As described in DBS&A (2007), the geologic formations important to the region range in age from Precambrian igneous rocks to Quaternary alluvial and eolian deposits. Figure 5-10 shows the approximate extents of geologic outcrops within the planning region. The 30 formations that crop out in or underlie the region are sequenced in a pancake layer of formations that dip to the southeast. The oldest formations, from Precambrian to Pennsylvanian, are not known to supply water. The Permian Yeso Formation, while water bearing, is comprised in part of interbedded anhydrite and other evaporite deposits that yield non-potable water. The geologic formations deposited later than the Yeso Formation begin to yield water, alternating with less productive formations. The most important formations for water supply are the Tertiary and Quaternary Ogallala, volcanic rocks, and alluvial deposits. In the northern portion of the planning region, particularly in Union County, where the Ogallala is less abundant, the Dakota Formation is an important aquifer. A summary of the thickness and water yields from youngest to oldest is provided in the accepted plan (DBS&A, 2007):

- Quaternary Alluvium: Up to 600 feet thick with yields up to 300 gallons per minute (gpm)
- Extrusive/Igneous Rocks: Up to 50 feet thick with yields over 1,000 gpm
- Ogallala: Up to 700 feet thick with yields up to 1,600 gpm
- Niobrara and Carlile Shale: Up to 1,250 feet thick and no known yield
- Greenhorn Limestone: Up to 60 feet thick with yields up to 10 gpm
- Graneros Shale: Up to 125 feet thick with no known yield
- Dakota Sandstone/Purgatoire Formation: Up to 300 feet thick with yields up to 400 gpm

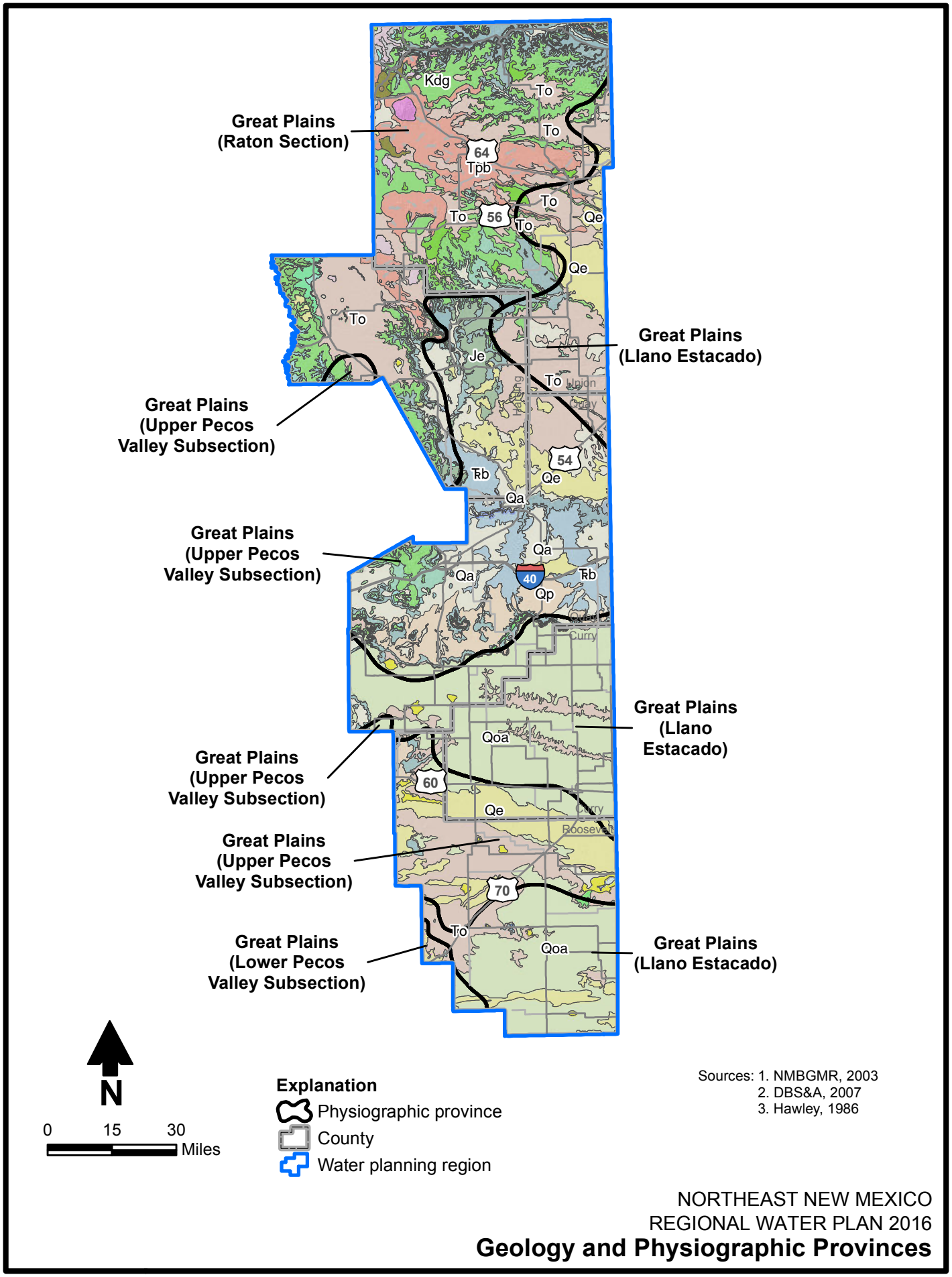
Great Plains
(Raton Section)
Great Plains
(Llano Estacado)
Great Plains
(Upper Pecos
Valley Subsection)
Great Plains
(Upper Pecos
Valley Subsection)
Great Plains
(Llano
Estacado)
Great Plains
(Upper Pecos
Valley Subsection)
Great Plains
(Upper Pecos
Valley Subsection)
Great Plains
(Lower Pecos
Valley Subsection)
Great Plains
(Llano Estacado)
Kdg
To
Tpb
Qe
Je
Rb
Qa
Qp
Qoa
64
56
54
40
60
70
Union
Curry
Roosevelt
N
0
15
30
Miles
Explanation
Physiographic province
County
Water planning region
Sources: 1. NMBGMR, 2003
2. DBS&A, 2007
3. Hawley, 1986
NORTHEAST NEW MEXICO
REGIONAL WATER PLAN 2016
Geology and Physiographic Provinces
S:\PROJECTS\WR12.0165_STATE_WATER_PLAN_2012\GIS\MXDS\FIGURES_2016\NORTHEAST_NEW_MEXICO\FIG5-10A_GEOLOGY.MXD 6/10/2016

Figure 5-10a

Source: NMBGMR, 2003

NORTHEAST NEW MEXICO
REGIONAL WATER PLAN 2016

Geology Explanation

Figure 5-10b

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- Morrison Formation: Up to 600 feet thick with yields of 1 to 2 gpm
- Summerville and Todilto Formations: Up to 600 feet thick with no known water yield
- Entrada Sandstone: Up to 300 feet thick with yields up to 600 gpm
- Redonda and Chinle Formations of the Dockum Group: Thicknesses up to 1,200 feet, but minor yields of 1 to 20 gpm from the Chinle Formation
- Santa Rosa Formation: Up to 450 feet thick with yields up to 150 gpm
- Bernal Formation: Up to 400 feet thick with no known water yield
- San Andres Formation: Up to 400 feet thick with no known water yield
- Glorieta Sandstone: Up to 220 feet thick with yields up to 15 gpm

The Ogallala is one of several formations comprising the High Plains Aquifer that extends into seven other states and is studied extensively by the USGS. Thicknesses within the planning region vary substantially from 0 to a maximum of 700 feet. It is generally absent in the western side of the planning region and thickens toward the east. It is up to 400 feet thick in Union County, but absent in the south-central and northern third of the county. In Harding County, the Ogallala aquifer is present only in the east-central portion and near the Village of Roy. It is up to 260 feet thick in Quay County, but has eroded away in the central part of the county. The Ogallala is the principal source of groundwater in Curry and Roosevelt counties.

Saturated thicknesses of the Ogallala are much less. A 2008 USGS study (Tillery, 2008) shows the saturated water levels for 2004-2007 in the Southern High Plains Aquifer for the Curry, Portales, and Causey Lingo UWBs. As of 2007, the greatest saturated thickness was estimated to be 116 feet in a small pocket at the eastern border of Roosevelt County in the Portales Valley UWB. Similarly, in Curry County UWB, the saturated thicknesses are generally less than 70 feet, with isolated areas of up to 90 feet thick. Fewer wells are present in the Causey Lingo UWB to fully characterize the saturated thickness of the aquifer, but as with areas to the north, the thickest parts are near the eastern border with Texas, where isolated areas are up to 100 feet thick.

The Northeast Soil and Water Conservation District and local communities are conducting a Union County hydrogeology project to describe the surface and shallow subsurface geology in eastern Union County. The project purpose is to collect information that will be used to develop accurate models of the aquifers near Clayton. The study has found that existing geologic maps of Union County are largely accurate representations of the surface geology, although the Ogallala Formation is not as thick as has often been assumed. The report states that the Ogallala Formation is probably not much more than 200 feet thick in eastern Union County and that the Cretaceous Dakota Formation plays a more important role in the groundwater system in this area than was previously thought (Zeigler, 2011).

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). Significant water level declines are well documented, especially for the communities in the southern portion of the region (e.g., Clovis and Portales). Rates of decline shown on Figure 5-11 are generally greatest in the thickest areas of the Ogallala aquifer where pumping is also more extensive. In 1986, Congress directed the USGS to measure water levels in the High Plains Aquifer every two years to track water level declines.

Hydrographs illustrating groundwater levels versus time, as compiled by the USGS (2014b), were selected for six monitor wells with longer periods of record and are shown on Figure 5-12. Tillery (2008) conducted a thorough analysis of water level declines in Curry and Roosevelt counties and found that the rate of water level decline (0.4 ft/yr to 1.8 ft/yr) is greatest in the areas of maximum saturated thickness and averaged about 1 ft/yr from 2004 to 2007.

Ute Dam and Reservoir was completed in 1963, for the purpose of providing a renewable municipal water supply for eastern New Mexico communities that currently depend on rapidly depleting groundwater for their water supply (NMISC, 2000).

Recharge to the aquifers in the Northeast New Mexico region occurs through direct rainfall and localized recharge of precipitation from playa lakes, the latter being the primary recharge mechanism. Recharge to aquifers in the planning region has been estimated by numerous investigators to range from less than 1 percent to 5 percent of total rainfall (Theis, 1937; Havens, 1966; Brown and Signor, 1973; Stone, 1984; Stone and McGurk, 1985; Wood and Sanford, 1995). Recharge estimates from the three modeling efforts that pertain to the Northeast New Mexico region were discussed in the earlier plan (DBS&A, 2007) and include:

- The U.S. Geological Survey's High Plains Regional Aquifer-System Analysis (RASA), which found that pre-development recharge rates ranged from 0.056 to 0.84 inches per year (in/yr) for the Central High Plains and from 0.086 to 1.03 in/yr for the Southern High Plains, with recharge differing by soil type (Luckey et al., 1986).

- A groundwater availability model for the central High Plains aquifer developed by the Texas Bureau of Economic Geology, with an emphasis on north Texas, used groundwater recharge rates of less than 1 percent for 72 percent and less than 2 percent for 92 percent of the modeled area. Higher recharge rates, between 5 and 6 percent, were used for just 3 percent of the modeled area, with the highest rates occurring in sandy soils on the eastern side of the Central High Plains (in Kansas, Oklahoma, and Texas) (Dutton et al., 2001).

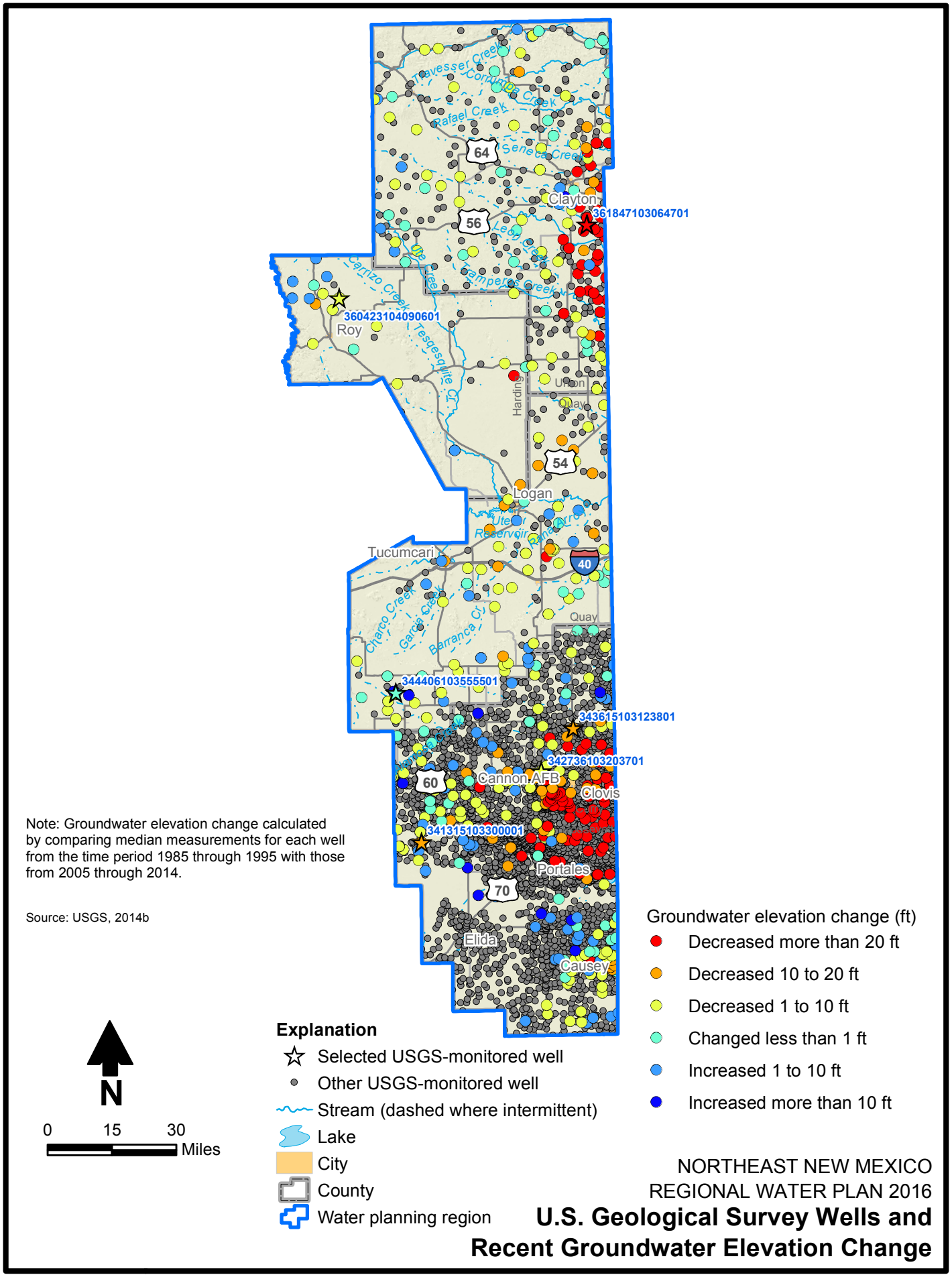

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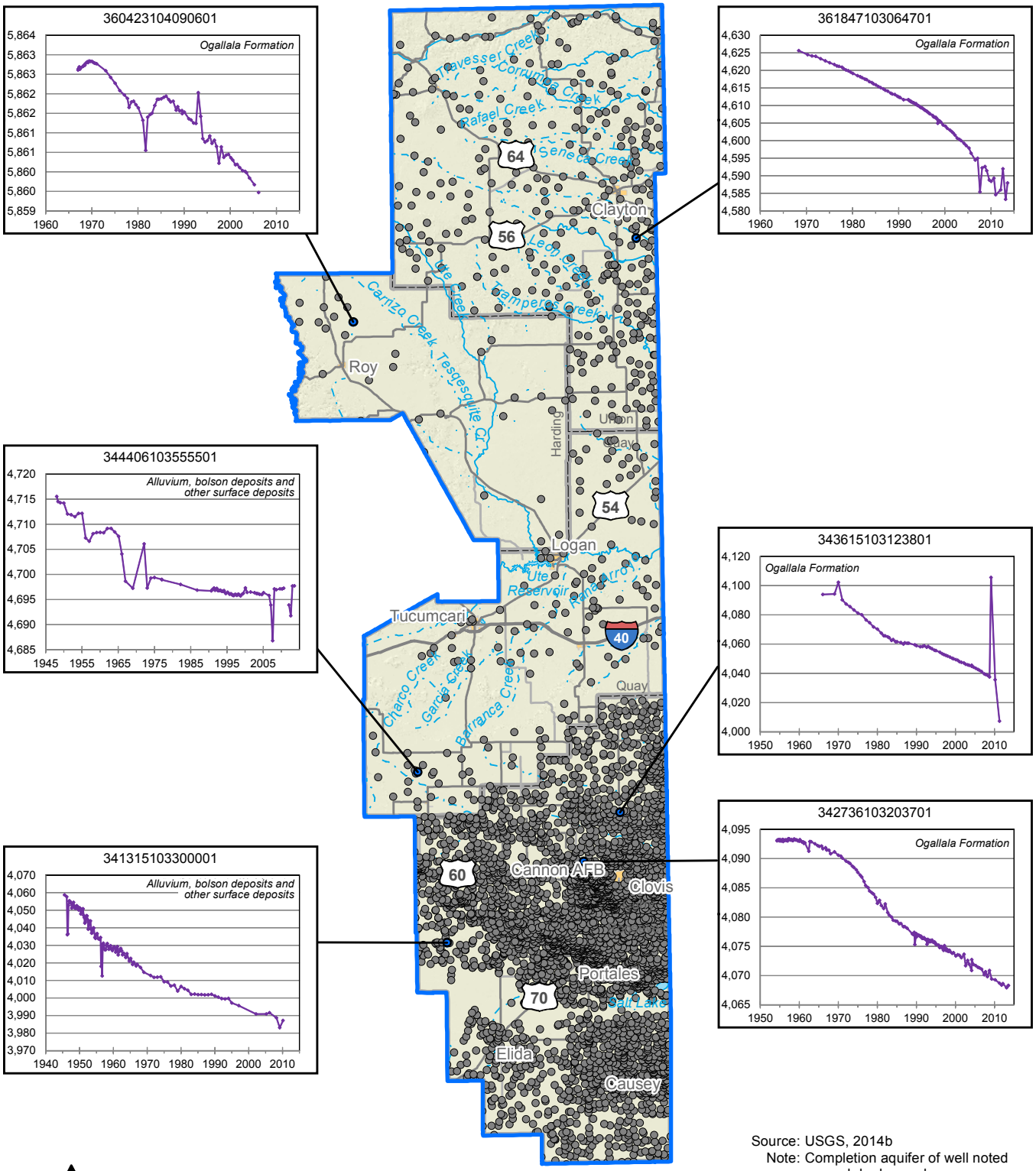
Figure 5-11



NORTHEAST NEW MEXICO
REGIONAL WATER PLAN 2016

Hydrographs of Selected Wells

Figure 5-12

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- A second groundwater availability model was developed for the southern Ogallala aquifer in New Mexico and Texas, and this modeling study found that recharge distribution in the Southern Ogallala is a function of both land use and soil type. The range in applied recharge values used in the transient model for the New Mexico portion of the study area included 1.75 in/yr for irrigated areas with high permeability and 1.25 in/yr for irrigated areas with medium-high permeability. Non-irrigated areas had recharge rates equivalent to the pre-development rates of 0.007 to 0.043 in/yr. For drought conditions, recharge rates were assumed to be 30 percent lower (Blandford et al., 2003).

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

- In Union County, three communities have well fields that provide the municipal water supply. The City of Clayton water supply wells are completed in the Ogallala aquifer and Dakota-Purgatoire Formation, the Village of Grenville wells are completed in the Dakota Sandstone and Permian aquifers, and the Village of Des Moines wells are completed in the Dakota Sandstone.

- In Harding County, the Village of Mosquero water supply wells are completed in the Dakota Sandstone aquifer. The Village of Roy reports that the Roy water supply wells are completed in the Ogallala aquifer.

- In Quay County, three communities maintain water supply well fields. The City of Tucumcari wells are completed in the Entrada Sandstone and alluvial aquifers, the Village of Logan wells are completed in the Santa Rosa Sandstone and alluvial aquifers, and the Village of House wells are completed in the Ogallala aquifer.

- In Curry County, water supply wells for the Villages of Grady, Melrose, and Texico, City of Clovis, and Cannon AFB are completed in the Ogallala aquifer.

- In Roosevelt County, water supply wells for the City of Portales and Villages of Dora, Causey, Elida, and Floyd are completed in the Ogallala aquifer.

Major irrigated areas identified in the Northeast New Mexico region include the area around Sedan in Union County, acreage irrigated by the Arch Hurley Conservancy District near Tucumcari in Quay County, the House area in Quay County, the Clovis area in Curry County, the Portales area in Roosevelt County, and the Causey-Lingo area in Roosevelt County.

In addition to these well fields, numerous domestic and stock wells are located throughout the Clayton, Canadian River, Tucumcari, Fort Sumner, Curry County, Portales, Causey Lingo, and Roswell UWBs.

The City of Portales reports a 9-year average rate of decline of 2.9 feet per year in the depth to groundwater in their wells, an average saturated thickness of 38 feet as of January 2013, and an optimistic estimate of 13 years for the remaining life of the aquifer (Wilson, 2013). Typical well yields for the Portales wells in the 1960s were 800 gallons per minute (gpm), compared to 100 gpm in 2012, and the City recognizes groundwater as a finite resource (Wilson, 2012).

The remaining saturated thickness of the Ogallala in the vicinity of Clovis is about 70 feet (Tillery, 2008). Rates of water level decline in USGS monitoring wells from 1985 to 2013 (Figure 5-11) are as high as 3.7 ft/yr. If this rate of decline continues, the aquifer will be dry in less than 20 years.

The Air Force Special Operations Command initiated a study of water resources in the area near Cannon Air Force Base, and a water sustainability and management report was published in 2012 (Trinity, 2012). The report documented the installation's water supply and demand and made recommendations for alternative water supply sources, conservation measures, and effective management of water resources. The Southern High Plains aquifer is the sole source of water supply for Cannon Air Force Base, and the study concluded that the aquifer is being mined at an exhaustive rate, with water levels expected to continue to decline at an increasing rate (Trinity, 2012). The study defines the Cannon Air Force Base water supply situation as critical but not dire and discussed water supply alternatives, including installing supplemental production wells in areas of the base that have greater saturated thickness, constructing a holding basin for treated wastewater to maximize the volume that can be reused for golf course irrigation, considering installation of a redundant potable water supply connection with EPCOR Water (the City of Clovis' private water supplier), and supporting the development of the ENMRWS pipeline as a viable alternative future water source (Trinity, 2012).

In 2015-2016, the New Mexico Bureau of Geology & Mineral Resources conducted a technical review of existing hydrogeology studies in Curry and Roosevelt counties, as part of the development of a source water protection plan. Groundwater elevations were measured in 121 wells and were compared with earlier measurements collected in 2004-2007 (Rawling, 2016). The study found progressively declining water levels, with a median water level decline of 4.2 feet between the 2004–2007 and 2010–2015 periods. In some areas, the High Plains Aquifer had been dewatered down to the underlying bedrock (Rawling, 2016). The study concluded that the groundwater level declines indicate a concern for groundwater availability in the region and that alternative groundwater options are limited in the area (Rawling, 2016).

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 Northeast New Mexico Water Planning Region is evaluated through periodic monitoring and comparison of sample results to pertinent water quality standards. In general, surface water quality is generally very good with some exceptions. Several reaches of rivers within the Upper Canadian and Upper Pecos 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. River reaches that do not fully support their designated uses, particularly those in the northern half of the planning region, fail to do so because of turbidity, stream bottom deposits, nutrients, metals, pathogens, temperature, and total dissolved solids (TDS). The sources for these pollutants include agriculture, recreation, road runoff, road construction, and municipal point sources (NMED, 2004). 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.

The other primary surface water quality concern is centered on playa lakes, which are the primary source of recharge for the High Plains aquifer.

Given that groundwater supplied 87 percent of the water use in the planning region in 2010, groundwater quality is an important consideration in the region. Until the Tucumcari Quay County Regional Water Authority and/or ENMWUA begin pumping surface water from Ute Reservoir, groundwater will continue to supply all of the drinking water systems and wells for private domestic consumption in the region. Generally the quality of groundwater in the planning region is good, with just a few issues:

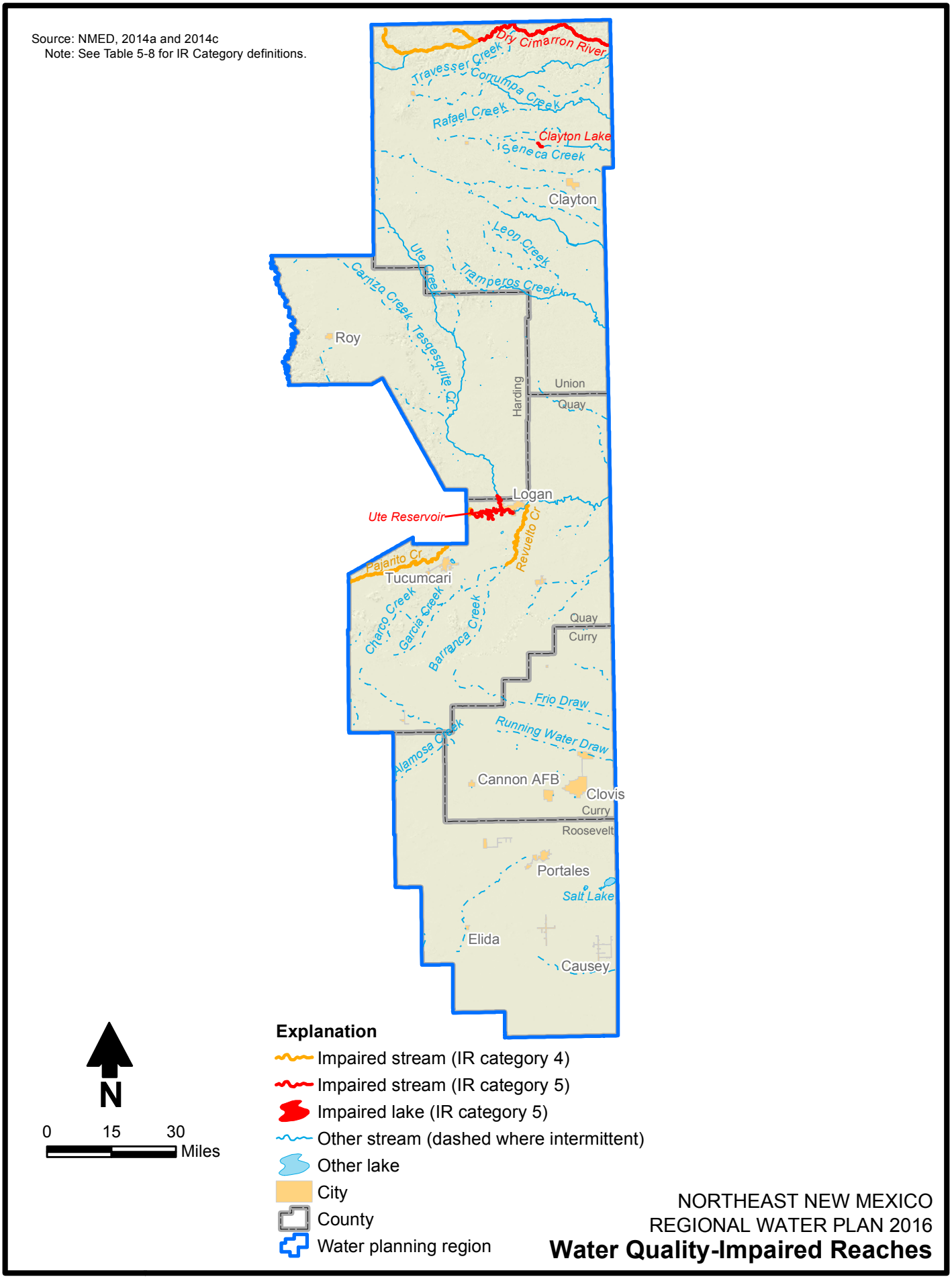
Source: NMED, 2014a and 2014c
Note: See Table 5-8 for IR Category definitions.
Dry Cimarron River
Travesser Creek
Corumpa Creek
Rafael Creek
Clayton Lake
Seneca Creek
Clayton
Leon Creek
Ute Creek
Tramperos Creek
Carrizo Creek
Tesgesquite Cr
Roy
Harding
Union
Quay
Logan
Ute Reservoir
Revuelto Cr
Pajarito Cr
Tucumcari
Charco Creek
Garcia Creek
Barranca Creek
Quay
Curry
Frio Draw
Running Water Draw
Alamosa Creek
Cannon AFB
Clovis
Curry
Roosevelt
Portales
Salt Lake
Elida
Causey
N
0
15
30
Miles
Explanation
Impaired stream (IR category 4)
Impaired stream (IR category 5)
Impaired lake (IR category 5)
Other stream (dashed where intermittent)
Other lake
City
County
Water planning region
NORTHEAST NEW MEXICO
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 Northeast New Mexico Water Planning Region

Waterbody Name (basin, segment) [a]	Assessment Unit ID	Affected Reach (miles [b])	Probable Sources of Pollutant	Uses Not Fully Supported [c]	Specific Pollutant	IR Category [d]
Union County						
Carrizozo Creek (OK bnd to headwaters)	NM-2701_40	44.8	Not assessed	—	—	3/3A
Clayton Lake	NM-9000.B_030	148.6 [e]	Source unknown	WWAL	Mercury in fish tissue	5/5C
Corrumpa Creek (OK border to headwaters)	NM-2701_30	73.96	Source unknown	WWAL	—	3/3A
Dry Cimarron R (Perennial reaches OK bnd to Long Canyon)	NM-2701_00	54.59	Source unknown	IRR CoolWAL	Oxygen, dissolved Sulfates Temperature, water Total dissolved solids	5/5C
Dry Cimarron River (Long Canyon to Oak Ck)	NM-2701_02	23.12	Waterfowl On-site treatment systems (septic) Wildlife other than waterfowl Drought-related Impacts Rangeland grazing	IRR PC	Escherichia coli Total dissolved solids	4A
Long Canyon (Perennial reaches abv Dry Cimarron)	NM-2701_20	8.23	Waterfowl Wildlife other than waterfowl Rangeland	PC WH CoolWAL	Escherichia coli Selenium	4A
Oak Creek (Dry Cimarron to headwaters)	NM-2701_10	11.72	Crop or dry land construction Waterfowl Wildlife other than waterfowl Drought-related Impacts Rangeland grazing Flow alterations from water diversions	ColdWAL PC	Escherichia coli Nutrient/eutrophication Biological indicators	4A

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
IRR = Irrigation
PC = Primary contact
WH = Wildlife habitat
WWAL = Warm water aquatic life

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

[e] Acres

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

Table 5-8. Total Maximum Daily Load Status of Streams in the Northeast New Mexico Water Planning Region

Waterbody Name (basin, segment) [a]	Assessment Unit ID	Affected Reach (miles [b])	Probable Sources of Pollutant	Uses Not Fully Supported [c]	Specific Pollutant	IR Category [d]
Harding County						
Ute Reservoir	NM-2302_00	3760.75 [e]	Source unknown	—	Aluminum Mercury in fish tissue	5/5C
Quay County						
Canadian River (Ute Reservoir to Conchas Reservoir)	NM-2303_00	63.36	Waterfowl Wildlife other than waterfowl Drought-related Impacts Rangeland grazing Flow alterations from water diversions	PC	Escherichia coli	4A
Pajarito Creek (Canadian River to headwaters)	NM-2303_10	55.92	Waterfowl Livestock (grazing or feeding operations) Municipal point source discharges Drought-related Impacts Rangeland grazing	PC	Escherichia coli Nutrient/eutrophication Biological indicators	4A
Revuelto Creek (Canadian River to headwaters)	NM-2301_10	26.17	Drought-related Impacts Irrigated crop production Natural sources	IRR	Boron	4A
Tucumcari Lake	NM-9000.B_103	349.43 [e]	Not assessed	—	—	3/3A
Ute Reservoir	NM-2302_00	3760.75 [e]	Source unknown	—	Aluminum Mercury in fish tissue	5/5C
Curry County						
Green Acres Lake	NM-9000.B_046	10.6 [e]	Not assessed	—	—	3/3A

Source: NMED, 2014a

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

[b] Unless otherwise noted.

[c] ColdWAL = Coldwater aquatic life
Cool WAL = Coolwater aquatic life
IRR = Irrigation
PC = Primary contact
WH = Wildlife habitat
WWAL = Warm water aquatic life

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

[e] Acres

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

Table 5-8. Total Maximum Daily Load Status of Streams in the Northeast New Mexico Water Planning Region

Waterbody Name (basin, segment) [a]	Assessment Unit ID	Affected Reach (miles [b])	Probable Sources of Pollutant	Uses Not Fully Supported [c]	Specific Pollutant	IR Category [d]
Curry County (cont.)						
Little Tule Lake	NM-9000.B_076	7.62 [e]	Not assessed	—	—	3/3A
Ned Houk Park Lakes	NM-9000.B_089	4 [e]	Not assessed	—	—	3/3A
Williams Playa (Curry)	NM-9000.B_108	15 [e]	Not assessed	—	—	3/3A
Roosevelt County						
Oasis Park Lake	NM-9000.B_092	2 [e]	Not assessed	—	—	3/3A

Source: NMED, 2014a

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

[b] Unless otherwise noted.

[c] ColdWAL = Coldwater aquatic life
Cool WAL = Coolwater aquatic life
IRR = Irrigation
PC = Primary contact
WH = Wildlife habitat
WWAL = Warm water aquatic life

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

[e] Acres

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

Table 5-8. Total Maximum Daily Load Status of Streams in the Northeast New Mexico 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 4A: Impaired for one or more designated uses, but does not require development of a TMDL because TMDL has been completed. AUs are listed in this subcategory once all TMDL(s) have been developed and approved by USEPA that, when implemented, are expected to result in full attainment of the standard. Where more than one pollutant is associated with the impairment of an AU, the AU remains in IR Category 5A (see below) until all TMDLs for each pollutant have been completed and approved by USEPA.

Category 5/5C: 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 are not enough data to determine the pollutant of concern or there are 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 Category 5A and a TMDL will be scheduled. If it is determined that the current designated uses are inappropriate, it will be moved to 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 Category 4C.

- In the northern half of the planning region, groundwater quality concerns are largely due to leaking underground storage tanks (USTs), septic systems, and grain silos that have been fumigated with compounds containing carbon tetrachloride (NMED, 2004).

- For the southern half of the planning region, groundwater quality concerns include leaking USTs, nitrates from agricultural activity, dairy operations, septic tanks, public and private sewage treatment plants, and petroleum, methane, and TDS contamination from oil and gas field operations (NMED, 2004).

- The High Plains Aquifer, the primary source of water in the Curry-Portales area, is quickly being depleted, while the underlying Triassic rocks have poor quality water.

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

5.4.1 Potential Sources of Contamination to Surface and Groundwater

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

5.4.1.1 Municipal and Industrial Sources

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

NPDES-permitted discharges in the planning region are summarized in Table 5-9 and shown on Figure 5-14; details regarding NPDES permits in New Mexico are available on the NMED's website (http://www.nmenv.state.nm.us/swqb/Permits/). The permitted discharges are primarily wastewater treatment plants and do not necessarily pose a significant water quality problem.

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

Table 5-9. Municipal and Industrial NPDES Permittees in the Northeast New Mexico Water Planning Region

Permit No	Municipality/Industry [a]	Permit Type [b]
Quay County		
NM0020711	Tucumcari, City of/WWTP [c]	Municipal (POTW)
Curry County		
NM0030236	Cannon Air Force Base [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 two outfall locations

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

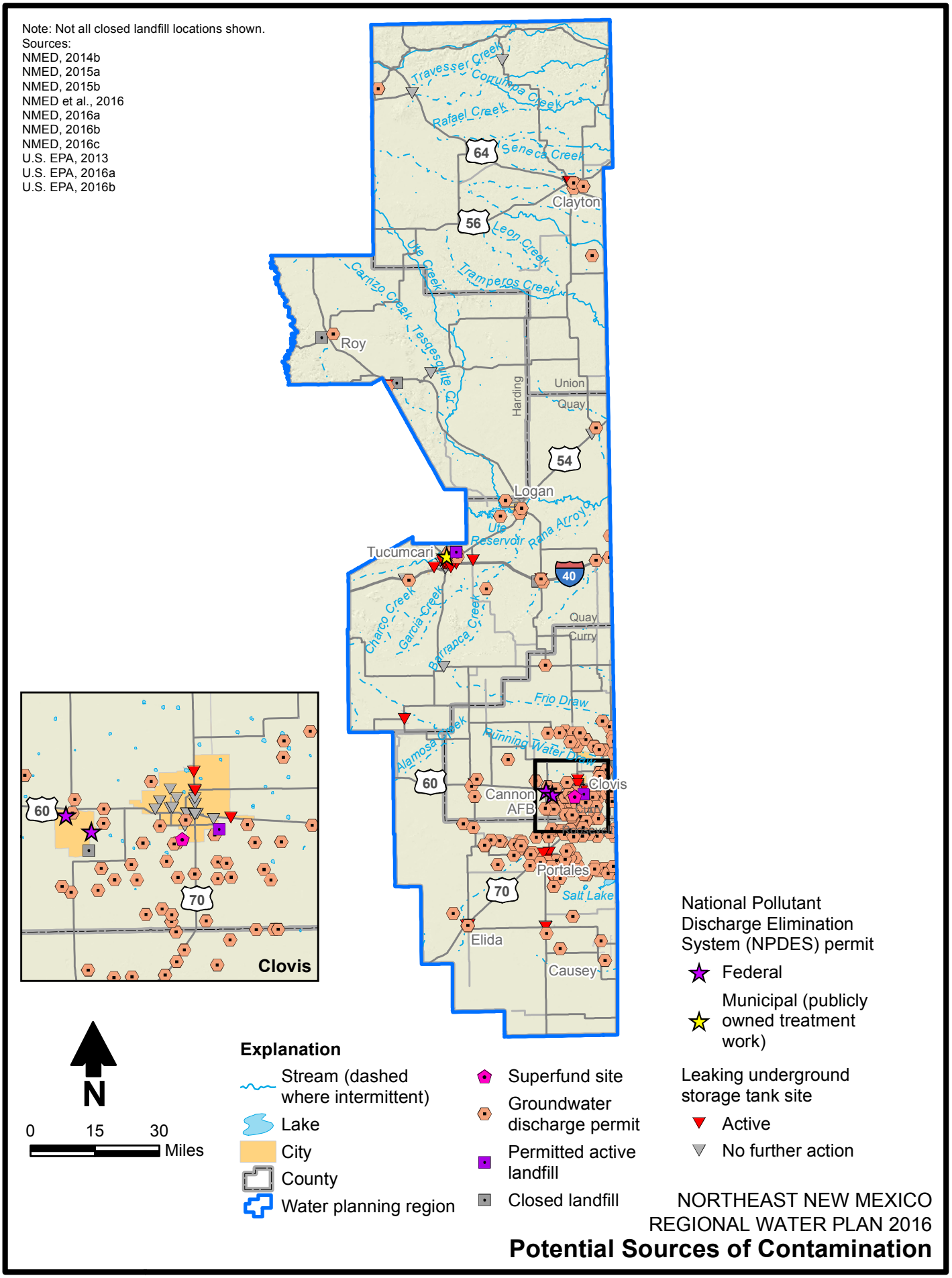
Note: Not all closed landfill locations shown.
Sources:
NMED, 2014b
NMED, 2015a
NMED, 2015b
NMED et al., 2016
NMED, 2016a
NMED, 2016b
NMED, 2016c
U.S. EPA, 2013
U.S. EPA, 2016a
U.S. EPA, 2016b
Travesser Creek
Corumba Creek
Rafael Creek
Seneca Creek
Clayton
Leon Creek
Ute Creek
Cantizo Creek
Tramperos Creek
Tesgesquite Cr.
Roy
Harding
Union
Quay
Logan
Ute Reservoir
Rana Arroyo
Tucumcari
Charco Creek
Garcia Creek
Barranca Creek
Curry
Frio Draw
Running Water Draw
Alamosa Creek
Clovis
Cannon AFB
Portales
Salt Lake
Elida
Causey
64
56
54
40
60
70
Clovis
N
0 15 30
Miles
Explanation
Stream (dashed where intermittent)
Lake
City
County
Water planning region
Superfund site
Groundwater discharge permit
Permitted active landfill
Closed landfill
National Pollutant Discharge Elimination System (NPDES) permit
Federal
Municipal (publicly owned treatment work)
Leaking underground storage tank site
Active
No further action
NORTHEAST NEW MEXICO
REGIONAL WATER PLAN 2016
Potential Sources of Contamination
S:\PROJECTS\WR12.0165_STATE_WATER_PLAN_2012\GIS\MXDS\FIGURES_2016\NORTHEAST_NEW_MEXICO\FIG5-14_CONTAM_SOURCES.MXD 6/10/2016

Figure 5-14

Table 5-10. Groundwater Discharge Permits in the Northeast New Mexico Water Planning Region

County	Facility Name [a]	Permit No.	Status [b]	Permitted Discharge Amount (gpd)
Union	Capulin Volcano National Monument	DP-1101	Active	3,777
	Clayton (Town of) - Wastewater Treatment Facility	DP-229	Active	250,000
	Little Acres Mobile Home Park	DP-1692	Pending	—
	North Eastern New Mexico Detention Facility	DP-1711	Active	2,000
Harding	Mosquero (Village of) - Wastewater Treatment Plant	DP-1237	Active	9,000
	Roy (Village of) - Wastewater Treatment Plant	DP-1311	Active	40,000
Quay	Drivers Travelmart FFP 408	DP-1783	Active	12,000
	Jean Smith Property - Village of Logan Sludge Application	DP-1789	Active	31,865
	Lake Meredith Salinity Control Project	DP-1054	Active	648,000
	Liberty Farm Implement and Supply	DP-1696	Active	267,863
	Logan (Village of) Sewer Collection System and Wastewater Treatment Ponds	DP-1705	Active	400,000
	New Mexico State University - Agricultural Science Center at Tucumcari	DP-1769	Active	720,000
	NMDOT Glenrio Rest Area	DP-1667	Active	12,000
	Russells Truck and Travel Center 2	DP-1765	Active	18,000
	San Jon (Village of) - Wastewater Treatment Plant	DP-535	Active	46,000
	Stuckeys 112 A	DP-1516	Active	2,150
	Stull Trailer Wash	DP-1125	Active	3,600
	Tucumcari (City of) Wastewater Treatment Facility	DP-1700	Active	1,200,000

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

gpd = Gallons per day

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

— = Not listed on GWQB web site

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

Table 5-10. Groundwater Discharge Permits in the Northeast New Mexico Water Planning Region

County	Facility Name [a]	Permit No.	Status [b]	Permitted Discharge Amount (gpd)
Quay (cont.)	Tucumcari Feed Yard	DP-1695	Active	60,000
Curry	Ute Lake Ranch Water Reclamation Facility	DP-1666	Active	333,000
	Arrowhead Dairy	DP-1553	Active	85,000
	BNSF Railway - Clovis	DP-10	Active	200,000
	Cannon Air Force Base	DP-873	Active	1,507,500
	Clovis (City of) - Wastewater Treatment Plant	DP-79	Active	8,000,000
	Cross Country Dairy	DP-1379	Active	75,000
	Day Star Dairy	DP-956	Active	80,000
	Desperado Dairy	DP-703	Active	65,000
	Do-Rene Dairy 2	DP-1111	Active	120,000
	El Dorado Dairy	DP-1277	Active	95,000
	FB Ranch LLC	DP-1475	Active	99,000
	Frozfruit Corporation	DP-1117	Active	40,000
	Grady School	DP-1511	Active	5,000
	Heritage Dairy	DP-1136	Active	100,000
	Highland Dairy	DP-851	Active	67,500
	Ideal Trailer Park	DP-587	Active	4,950
	Legend Dairy	DP-1197	Active	160,000
	Melrose (Village of) - Wastewater Treatment Plant	DP-808	Active	90,000

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

gpd = Gallons per day

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

— = Not listed on GWQB web site

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

Table 5-10. Groundwater Discharge Permits in the Northeast New Mexico Water Planning Region

County	Facility Name [a]	Permit No.	Status [b]	Permitted Discharge Amount (gpd)
Curry (cont.)	Mesa Ingredients - Clovis Plant	DP-1529	Active	7,840
	Mid Frisian Dairy	DP-1026	Active	40,000
	Mighty Vac	DP-1030	Active	6,000
	N&N Dairy	DP-1413	Active	109,250
	Native Pastures Dairy	DP-1091	Active	2,000
	North Point Dairy	DP-1163	Active	180,000
	Palla Dairy	DP-1199	Active	160,000
	Providence Dairy	DP-1321	Active	105,000
	Rajen Dairy	DP-706	Active	200,000
	Rajen Dairy II	DP-878	Active	72,000
	Ridgecrest Dairy	DP-1346	Active	87,500
	Roberts Farm	DP-1820	Active	9,000,000
	Rocket Industries	DP-948	Active	24,000
	Route 77 Dairy	DP-1455	Active	90,000
	Sams Mobile Home Park	DP-1503	Active	9,250
	SAS Dairy	DP-674	Active	24,000
	South Slope Dairy	DP-934	Active	225,000
	Southern Draw Dairy	DP-1022	Active	108,000
	Southwest Cheese Company - Clovis Plant	DP-1508	Active	2,000,000

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 Northeast New Mexico Water Planning Region

County	Facility Name [a]	Permit No.	Status [b]	Permitted Discharge Amount (gpd)
Curry (cont.)	Stateline Ranch	DP-1537	Active	16,000
	Sunwest Dairy	DP-1288	Active	60,000
	Texico (City of) Wastewater Treatment Plant	DP-1759	Active	102,400
	Texico (City of) Wastewater Treatment Plant	DP-1778	Active	1,465,000
Roosevelt	4-Way Dairy	DP-1245	Active	90,000
	Adkins Farm	DP-1821	Active	2,304,000
	Amistad Dairy	DP-514	Active	6,000
	Anderson Dairy 2	DP-826	Active	4,500
	Arch Diamond Dairy	DP-1531	Active	65,000
	Back Nine Dairy	DP-595	Active	10,000
	Bonestroo Dairy LLC	DP-898	Active	43,000
	Brouwer Dairy	DP-753	Active	24,000
	City of Portales - Sludge	DP-1809	Active	27,050
	Clover Knolls Dairy	DP-1320	Active	124,000
	Cooper Legacy Dairy	DP-1299	Active	65,000
	Crosswinds Dairy	DP-1251	Active	50,000
	Dairy Farmers of America - Portales	DP-941	Active	1,118,000
	Desert Star Dairy	DP-1313	Active	40,000
	Dora Consolidated Schools	DP-1521	Active	10,535

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

gpd = Gallons per day

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

— = Not listed on GWQB web site

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

Table 5-10. Groundwater Discharge Permits in the Northeast New Mexico Water Planning Region

County	Facility Name [a]	Permit No.	Status [b]	Permitted Discharge Amount (gpd)
Roosevelt (cont.)	Elida Municipal Schools	DP-1425	Active	3,425
	Floyd Municipal Schools	DP-1382	Active	5,650
	Grande Vida Dairy	DP-1377	Active	49,500
	Greenfield Park Dairy	DP-1286	Active	40,000
	H and R Westra Dairy	DP-667	Active	20,000
	Hide-A-Way Dairy	DP-1246	Active	61,250
	James Idsinga Sr & Son Dairy	DP-1001	Active	32,000
	J-Lu Dairy	DP-1315	Active	85,000
	Mathews Dairy	DP-1287	Active	9,750
	Midway Dairy	DP-932	Active	42,074
	New Mexico Christian Children's Home	DP-1492	Active	9,500
	Opportunity Dairy	DP-1332	Active	65,000
	Parkland Dairy LLC	DP-737	Active	15,000
	Philmar Dairy	DP-384	Active	40,000
	Portales (City of) - Wastewater Treatment Plant	DP-887	Active	2,500,000
	Portales National Guard Armory	DP-820	Active	3,080
	Randy and Kam Knight Horse/Hay	DP-1828	Active	999,999
	S & V Dairy LLC	DP-1067	Active	7,000
	Saltridge Dairy	DP-1154	Active	30,000

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 Northeast New Mexico Water Planning Region

County	Facility Name [a]	Permit No.	Status [b]	Permitted Discharge Amount (gpd)
Roosevelt (cont.)	Sandcrest Dairy	DP-1423	Active	65,000
	Severn Peanut Company dba Hampton Farms - Portales	DP-1745	Active	3,780
	Sunridge Dairy	DP-1517	Active	75,000
	Village of Floyd Water Treatment System	DP-1737	Active	16,700
	W Diamond Dairy	DP-880	Active	49,999
	Western Star Dairy	DP-666	Active	20,000
	Wild West Dairy	DP-390	Active	6,000

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

gpd = Gallons per day

— = Not listed on GWQB web site

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

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

5.4.1.2 Remediation Sites

The accepted regional water plan (DBS&A, 2007) identified one site in the planning region that was previously listed by the U.S. EPA (2004) as a Superfund site: the AT&SF Clovis site (Table 5-11) at Santa Fe Lake. Santa Fe Lake is a playa lake, located approximately 1 mile south of the Burlington Northern Santa Fe (BNSF) railroad yard in Clovis, New Mexico. Wastewater from the yard was discharged into the lake beginning in the early 1900s. This site was deleted from the final National Priorities List (NPL) on March 17, 2003, after approximately 187,000 cubic yards of total petroleum hydrocarbon-contaminated soil and sediment were treated and the site was planted with native grasses. Contaminants of concern included boron, fluoride, chloride, total phenolics, sulfate, petroleum hydrocarbons, total dissolved solids, and total organic carbon.

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

Table 5-11. Superfund Sites in the Northeast New Mexico Water Planning Region

Site Location	Site Name [a]	Site ID	EPA ID	Status [b]
Curry County				
Clovis, NM	AT & SF (Clovis)	NMD043158591	600827	Deleted from NPL

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

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

[b] NPL = National Priorities List

5.4.1.3 Leaking Underground Storage Tanks

Leaking underground storage tank (UST) sites present a potential threat to groundwater, and the NMED maintains a database of registered USTs. Many of the facilities included in the UST database are not leaking and even leaking USTs may not necessarily have resulted in groundwater contamination or water supply well impacts. These USTs could, however, potentially impact groundwater quality in and near the population centers in the future. UST sites in the Northeast New Mexico region are identified on Figure 5-14. Many of those UST sites listed in the NMED database require no further action, and these sites 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 5-12. Leaking Underground Storage Tank Sites in the Northeast New Mexico Water Planning Region

City [a]	Release/Facility Name [b,c]	Release ID	Facility ID	Physical Address [c]	Status [d]
Union County					
Clayton	Former Texaco	4104	27928	623 S 1st St	Cleanup, Responsible Party
	Bottle Neck Inc	3606	27023	Hwy 87 S	Cleanup, Responsible Party
	Kears Exxon	3560	28829	601 S First St	Cleanup, Responsible Party
	Ww Parts & Supply	1775	31516	320 N First	Cleanup, Responsible Party
Harding County					
Mosquero	Pats Service Station	3258	29879	3rd and Main	Cleanup, Responsible Party
Quay County					
Nara Visa	Nara Visa Truck Terminal	4606	53231	Hwy 54	Cleanup, Responsible Party
San Jon	Drivers Travel	1319	28016	2405 State Hwy 469	Cleanup, Responsible Party
	Bryants Conoco	196	998	State Rd 39	Pre-Investigation, Confirmed Release
	Halls Well	903	28453	NM 66 E of Town	Aggr Cleanup Completed, St Lead, CAF
Tucumcari	Chevron 75762	426	27328	E Hwy 66	Cleanup, Responsible Party
	Circle K 839	73	1144	601 E Tucumcari	Cleanup, Responsible Party
	Town & Ctry Food 148	1240	1161	201 E Tucumcari Blvd	Investigation, Responsible Party
	Conway Oil Bulk Plnt	2748	1162	412 Railroad Avenue	Cleanup, Responsible Party
	Davids Conoco	3680	27639	801 E Main	Investigation, Responsible Party

Source: NMED, 2014e

[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 Northeast New Mexico Water Planning Region

City [a]	Release/Facility Name [b,c]	Release ID	Facility ID	Physical Address [c]	Status [d]
Quay County (cont.)					
Tucumcari (cont.)	Bar F 13	77	1238	401 W Tucumcari Blvd	Monitoring, Responsible Party
	Flying J Travel Plaza #691	4647	54615	2021 S Mountain Rd	Cleanup, Responsible Party
	Holiday Chevron	4585	1407	3623 E Tucumcari Blvd	Investigation, Responsible Party
	Holiday Conoco	1762	28571	4002 E Tucumcari Blvd	Aggr Cleanup Completed, Resp Party
	Bar F 11	439	29238	701 E Main St	Cleanup, Responsible Party
	Martinez Plumbing	912	29281	1019 E Main	Cleanup, Responsible Party
	Rigdon Texaco	2070	1720	123 E Tucumcari Blvd	Investigation, Responsible Party
	Sandia Tucumcari Fina 34	4401	30436	702 E Tucumcari Blvd	Cleanup, Responsible Party
	Sw Public Service	453	30710	301 W Railroad Ave	Referred to Ground Water Quality Bureau
	Worley Mills (Tucumcari Ethanol Plant)	414	31672	702 W Cambell	Investigation, State Lead, CAF
	Tucumcari Municipal Airport	1322	31241	6352 Quay Rd Ai	Cleanup, State Lead with CAF
	Tucumcari Truck	730	31248	Exit 329 I 40	Cleanup, Responsible Party
	Whiting Bros Tucumcari	48	31628	E Tucumcari Blvd	Investigation, Responsible Party
	Steere Tank	626	27315	Hwy 54 Ne	Investigation, Responsible Party
	Tucumcari City of B	699	31235	202 N Monroe	Aggr Cleanup Completed, Resp Party
	NMSHTD Tucumcari	738	31249	US Hwy 54 Mile Post 305	Aggr Cleanup Completed, Resp Party

Source: NMED, 2014e

[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
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Table 5-12. Leaking Underground Storage Tank Sites in the Northeast New Mexico Water Planning Region

City [a]	Release/Facility Name [b,c]	Release ID	Facility ID	Physical Address [c]	Status [d]
Quay County (cont.)					
Tucumcari (cont.)	K-Mart Station	1336	1446	1819 E Tucumcari Blvd	Investigation, Responsible Party
	Yocums Texaco	2568	2034	1823 E Tucumcari Blvd	Investigation, State Lead, CAF
	Tucumcari Chevron	3395	31234	300 W Tucumcari Blvd	Cleanup, Responsible Party
	Circle K Store-8931	4512	1418	2624 S First St	Investigation, Responsible Party
House	House Coop	4682	53507	2200 Hwy 252	Pre-Investigation, Confirmed Release
Curry County					
Melrose	Melrose Tire	4603	7154	Hwy 60/84	Pre-Investigation, Confirmed Release
Cannon AFB	1402 Sewage Lift Sta	2398	30940	Facility 1402	Referred to Ground Water Quality Bureau [e]
	Facility #1400-Hospital	2415	30940	Facility 1402	Investigation Federal Facility
	Bldg/Fac 2110	2432	30948	Facility 2110	Cleanup, Federal Facility [e]
	Bldg 10	2434	30933	Facility 10	Cleanup, Federal Facility
	Facility 728	2439	30990	Facility 728	Investigation Federal Facility [e]
	Bldg 600	2445	30989	Facility 600	Investigation Federal Facility [e]
	Facility #3060	2500	30964	Facility 3060	Investigation Federal Facility
	Facility 130	2520	30935	Facility 130	Investigation Federal Facility

Source: NMED, 2014e

[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
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State Lead: State has assumed responsibility for mitigation of release
Federal Facility: Responsibility under the Federal Govt
CAF: Corrective action fund

[e] Release should be listed as no further action according to Cannon Air Force Base (2016).

Table 5-12. Leaking Underground Storage Tank Sites in the Northeast New Mexico Water Planning Region

City [a]	Release/Facility Name [b,c]	Release ID	Facility ID	Physical Address [c]	Status [d]
Curry County (cont.)					
Cannon AFB (cont.)	Bldg 368	2529	30970	Facility 368 a	Investigation Federal Facility [e]
	Bldg 2285	2530	30953	Facility 2285	Investigation Federal Facility [e]
Clovis	Allsups - No 170	4629	867	3500 N Prince St	Pre-Investigation, Confirmed Release
	Allsups #320	4623	31013	2021 N Prince St	Investigation, Responsible Party
	Rierson Motors	3309	30231	3500 Mabry Dr	Pre-Investigation, Confirmed Release
Roosevelt County					
Portales	C And S Fuel Shop	4444	52342	325 N Ave B	Investigation, Responsible Party
	C And S Oil Co Inc	3532	1013	222 N Main	Investigation, Responsible Party
	Cardlock Station	3531	1021	108 N Ave B	Cleanup, Responsible Party
	C&S Card Lock	2256	1281	100 S Chicago	Investigation, Responsible Party
	Portales Chevron	4018	1677	321 W 2nd	Cleanup, Responsible Party
	Roosevelt County Road Department	4680	30307	1600 N Boston	Pre-Investigation, Confirmed Release
	Hwy 70 Truckstop	2023	28532	1601 W 2nd	Cleanup, Responsible Party
Elida	Dixon Oil Co.	4567	27747	E Hwy 70	Cleanup, Responsible Party
	Anthony Farms	4674	54741	501 Clark St	Pre-Investigation, Confirmed Release
Dora	Dora Station	4536	52343	141 Dora Main St	Investigation, Responsible Party

Source: NMED, 2014e

[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
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CAF: Corrective action fund

[e] Release should be listed as no further action according to Cannon Air Force Base (2016).

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 2 operating landfills and 15 closed landfills (Table 5-13, Figure 5-14).

The Clovis Regional Solid Waste Facility Landfill is impacted by tetrachloroethylene (PCE) and nitrate from an undetermined source (CDM, 2009). The City uses an extraction well at the landfill and pipes the extracted contaminated groundwater to the City wastewater treatment plant for treatment. To determine the progress of the cleanup, the City monitors groundwater quality at the landfill semiannually. Concentrations of PCE in groundwater have declined since the extraction well came online in 2005, but continued to exceed the groundwater quality standards in several wells as of 2011 (CDM, 2011).

5.4.1.5 Nonpoint Sources

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

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

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

Other nonpoint sources of pollutants that are concerns for surface water quality in the planning region include agriculture, recreation, road runoff, and road construction (NMED, 2004). No perennial streams are present in the southern half of the planning region, and so surface water quality concerns in this area are centered on playa lakes, which are the primary source of recharge for the High Plains aquifer.

Table 5-13. Landfills in the Northeast New Mexico Water Planning Region

County	Landfill Name [a]	Landfill Operating Status	Landfill Closure Date
Union	Clayton	Closed	2008
	Clayton C&D	Closed	—
Harding	Mosquero C&D	Closed	—
	Mosquero Landfill	Closed	—
	Roy Landfill	Closed	—
Quay	Logan Landfill	Closed	1998
	Logan C&D	Closed	2000
	San Jon C&D	Closed	—
	San Jon Landfill	Closed	—
	Tucumcari C&D	Closed	—
	Tucumcari Landfill (New)	Open	NA
	Tucumcari Landfill (Old)	Closed	2012
Curry	Cannon AFB Asbestos Landfill	Closed	—
	Clovis Regional Solid Waste Facility Landfill	Open	NA
	Texico C&D	Closed	—
Roosevelt	Elida C&D	Closed	—
	Portales	Closed	—

Sources: DBS&A, 2007; NMED, 2014b, 2015a, 2015b; City of Clayton, 2014

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

NA = Not applicable

— = Information not available

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). One such watershed alliance in the Northeast New Mexico region, the Canadian River Riparian Restoration Project, which is a collaboration of eight soil and water conservation districts in northeastern New Mexico, aims to protect and restore the Canadian River Basin by controlling invasive vegetation using chemical, mechanical, and biological methods.

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 Northeast New Mexico region, as reported in the *New Mexico Water Use by Categories 2010* report (Longworth et al., 2013), was 528,448 acre-feet. Of this total, 67,136 acre-feet were surface water withdrawals and 461,312 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 Northeast New Mexico 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 Causey Lingo, Curry, and Portales UWBs in decade 2060 was calculated to be below the 2010 supply in a normal (i.e., no drought) year. This estimate was based on a predicted decline of 109 feet in the Curry County area, which is much more than the median water columns as shown in Table 5-14a. While a decline of greater than 100 percent is not possible, it indicates that the supply will diminish before 2060.

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 Causey Lingo, Clayton, Curry County, and Portales UWBs are about 17 to 69 feet by 2060, assuming an average water level decline of between 0.3 and 1.4 feet per year. A predicted decline of 17 feet in the Causey Lingo UWB would impact about 17 percent of the wells, much less than the impact predicted by the groundwater model (which used only the value for Curry County). For the Portales UWB, the predicted decline is 67feet, which would impact 100 percent of the wells. 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.

Table 5-14a. Projected Groundwater Supply in Causey Lingo, Curry County, and Portales Underground Water Basins in 2060, Based on Modeled Drawdown

Row	Calculation Step	Underground Water Basin			Explanation/Source
		Causey Lingo	Curry County	Portales	
1	Estimated groundwater diversions in 2010 (ac-ft/yr)	17,749	178,663	181,065	Longworth et al., 2013 (Curry, Portales and Causey Lingo UWBs)
2	Modeled pumping in future decades (ac-ft/yr)	496,027			Musharrafieh, 2015b
3	Ratio of administrative supply to modeled pumping	0.76			Total of Row 1 divided by Row 2
4	Median water column (feet)	69.0	77.5	47.5	Difference between water level at the top of the well and total depth of the well, based on 66 wells in Causey Lingo UWB, 220 wells in Curry County UWB, and 86 wells in Portales UWB from WATERS database with post-1997 water level
5	Available water column (feet)	48.3	54.3	33.3	NMISC Handbook (2013) guideline (70% of median water column)
6	Predicted drawdown from model into 2060 (feet)	143			Greatest decline in the modeled area (Curry County) (Musharrafieh, 2015c)
7	Adjusted model-predicted drawdown in 2060 (feet)	109			Row 3 times Row 6
8	Percentage of wells impacted (percentage reduction in supply)	113%	100%	164%	Row 7 divided by Row 5 times 50%
9	Revised supply by 2060 due to continued pumping (ac-ft/yr)	0	0	0	Row 1 reduced by Row 8

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

Table 5-14b. Projected Groundwater Supply in Causey Lingo, Clayton, Curry County, and Portales Underground Water Basins in 2060, Based on Observed Rate of Decline

Row	Calculation Step	Underground Water Basin				Explanation/Source
		Causey Lingo	Clayton	Curry County	Portales	
1	Estimated groundwater diversions in 2010 (ac-ft/yr)	17,749	67,749	178,663	181,065	Longworth et al., 2013
2	Median water column (feet)	69.0	123	77.5	47.5	Difference between water level at the top of the well and total depth of the well, based on 66 wells in Causey Lingo UWB, 214 wells in Clayton UWB, 220 wells in Curry County UWB, and 86 wells in Portales UWB from WATERS database with post-1997 water level
3	Available water column	48.3	86.1	54.3	33.3	NMISC Handbook (2013) guideline (70% of median water column)
4	Rate of water level decline (ft/yr)	0.33	1.34	1.38	1.33	Using the water level data for USGS monitor wells within 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)	16.5	67.0	69.0	66.5	The average rate of water level decline was multiplied by 50 years to predict the average drawdown by 2060.
6	Percentage of wells impacted	17%	39%	64%	100%	Row 5 divided by Row 3 and multiplied by 50%
7	Groundwater supply from mined sub-basins in 2060 (ac-ft/yr)	14,717	41,389	65,043	0	Row 1 reduced by Row 6

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

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.
- The modeled impacts are for the most heavily stressed area and may overestimate the impact on the Causey Lingo UWB.

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, 2010 was a year with above average snowpack for the closest two SNOTEL stations (located in nearby Taos and Colfax counties) (Figure 5-5). According to the PDSI (Figure 5-6), 2010 was near normal in Climate Division 2, with an incipient wet spell in Climate Division 3 (with some months being slightly wet and some dry). As discussed in Section 5.1, the PDSI is an indicator of whether drought conditions exist and if so, what the relative severity of those conditions is. Given that the water use data for 2010 represent a near normal to incipient wet year, it cannot be assumed that this supply will be available in extreme drought years such as those experienced most recently; it is important that the region also consider potential water supplies during these extreme 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 (groundwater supplies are evaluated below) based on the historical low surface water 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.

Three gages in the Northeast New Mexico region, and one gage upgradient of the region, have a long-term record that included 2010 data. The upgradient gage on the Canadian River near Sanchez best represents the surface water available to the region; this gage had a ratio of 0.03 for minimum annual yield (1,955 acre-feet in 2003) to 2010 yield (57,628 acre-feet) (USGS, 2014c). Based on the region's total administrative surface water supply of 67,136 acre-feet (Section 5.5.1), the drought-adjusted surface water supply is 2,014 acre-feet. Although NMISC (Widdison, 2014) has determined that the "firm yield" from the Ute Reservoir is 24,000 acre-feet per year, a prolonged extreme drought could impact the surface water supply. If the surface water shortages are shared equally and using the 0.03 ratio of minimum flow to the 2010 average supply described above, the Ute Pipeline would be able to deliver only about 720 acre-feet per year during this extreme drought.

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 for 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). For those basins where no model is available or model results were not available, a drought adjustment of 12 percent was used, based on the average of the modeled drawdown from all the NMOSE administrative models for other regions of the state.
- 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.

Using the modeled results of projected decline in the Curry and Portales UWBs and the rate of water level decline for Clayton and Causey Lingo UWBs to predict the impacts due to continued pumping and applying a 12 percent reduction, as discussed above, to account for a 20-year drought, the estimated 2060 administrative supply in the four closed basins is about 10 percent of the 2010 groundwater supply, for a total of about 45,850 acre-feet per year in 2060. Outside of the closed basins, but within Northeast New Mexico planning region, 16,100 acre-feet are pumped and assumed to be unaffected by drought. Combined with the impacts of drought on surface water supplies, which are projected to be about 2,000 acre-feet per year during a drought, the water supply in 2060 is estimated to be 88 percent less than the 2010 water use, or 63,950 acre-feet per year.

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 population (Sections 6.2 and 6.3, respectively), 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:

Table 5-15. Projected Drought Groundwater Supply in the Northeast New Mexico Water Planning Region in 2060

Row	Calculation Step	Underground Water Basin				Explanation/Source
		Causey Lingo	Clayton	Curry County	Portales	
1	Estimated groundwater diversions in 2010 (ac-ft/yr)	17,749	67,749	178,663	181,065	Longworth et al., 2013
2	Reduction in supply due to 50 years of pumping and 20-year drought	17+12 = 29%	39+12 = 51%	100+12 = 112%	164+12 = 176%	Values from Row 6 of Table 5-14b for Causey Lingo and Clayton UWB and values from Row 8 of Table 5-14a for Curry County and Portales UWB added to the average impact estimated from all OSE models (12%).
3	Revised supply by 2060 with 20-year drought (ac-ft/yr)	12,587	33,259	0	0	Row 1 reduced by the Row 2 total percentage

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

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

6.1 Present Uses

The most recent assessment of water use in the region was compiled by NMOSE for 2010, as discussed in Section 5.4. The *New Mexico Water Use by Categories 2010* report (Longworth et al., 2013) provides information on total withdrawals for nine categories of water use:

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

The total surface water and groundwater withdrawals for each category of use, for each county, and for the entire region, are shown on Table 6-1 and Figure 6-1. The predominant water use in 2010 in the Northeast region was for irrigated agriculture.

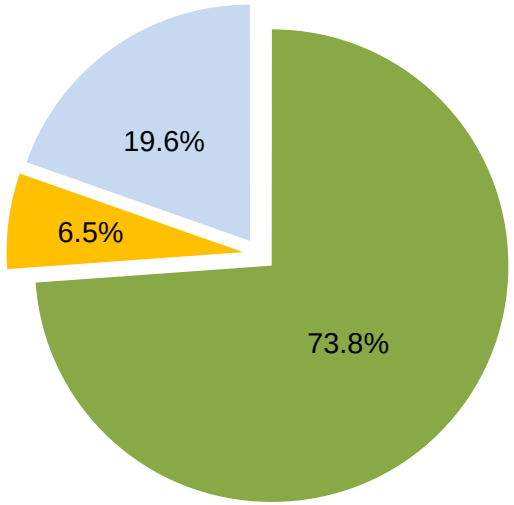
Groundwater supplied 93 percent of the total withdrawals in the Northeast New Mexico region in 2010. While most of the groundwater use in the region is for irrigated agriculture, groundwater also supplies public water supply, livestock, commercial, and other uses. Groundwater points of diversion are shown in Figure 6-2.

Table 6-1. Total Withdrawals in the Northeast New Mexico Water Planning Region in 2010

Water Use Category	Withdrawals (acre-feet)																	
	Union County			Harding County			Quay County			Curry County			Roosevelt 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	Surface Water	Ground-water	Total
Commercial (self-supplied)	0	174	174	0	1	1	0	164	164	0	1,418	1,418	0	177	177	0	1,934	1,934
Domestic (self-supplied)	0	172	172	0	25	25	0	66	66	0	743	743	0	176	176	0	1,181	1,181
Industrial (self-supplied)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Irrigated agriculture	1,800	66,686	68,486	0	3,073	3,073	36,212	7,947	44,159	0	167,172	167,172	0	186,021	186,021	38,012	430,899	468,911
Livestock (self-supplied)	159	1,449	1,608	82	347	429	50	464	514	174	6,297	6,471	84	5,135	5,219	549	13,692	14,241
Mining (self-supplied)	0	0	0	0	0	0	0	0	0	0	7	7	0	151	151	0	158	158
Power (self-supplied)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Public water supply	0	564	564	0	69	69	0	1,701	1,701	0	8,219	8,219	0	2,895	2,895	0	13,449	13,449
Reservoir evaporation	478	0	478	0	0	0	28,097	0	28,097	0	0	0	0	0	0	28,575	0	28,575
Total	2,437	69,044	71,482	82	3,514	3,596	64,359	10,343	74,702	174	183,856	184,029	84	194,555	194,639	67,136	461,312	528,448

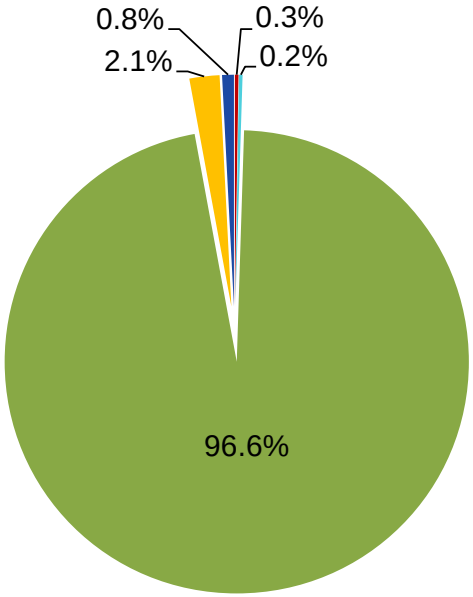
Source: Longworth et al., 2013

Surface Water



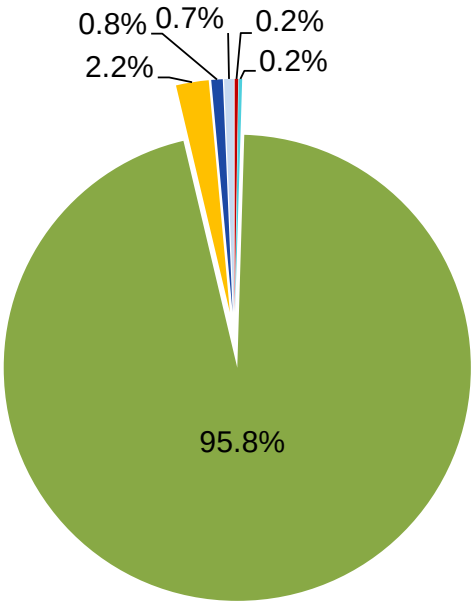
Total usage: 2,437 acre-feet

Groundwater



Total usage: 69,044 acre-feet

Total



Total usage: 71,482 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

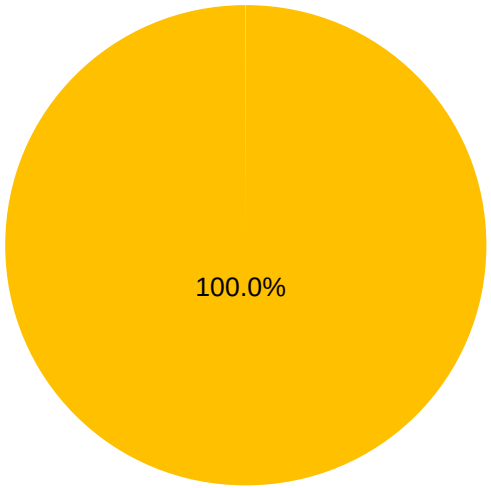
Note: Only categories with usage above 0.1% are shown.

NORTHEAST NEW MEXICO
REGIONAL WATER PLAN 2016

Union County Water Demand, 2010

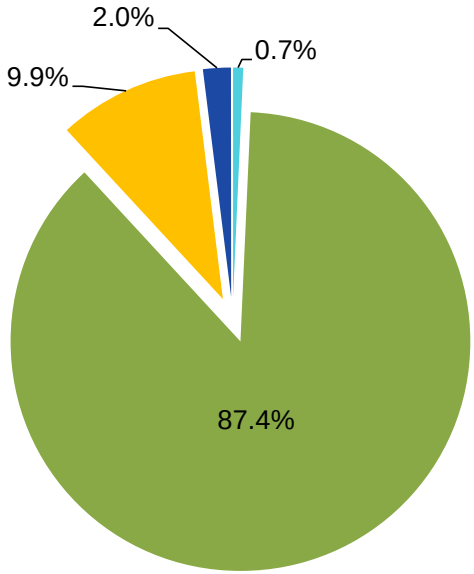
Figure 6-1a

Surface Water



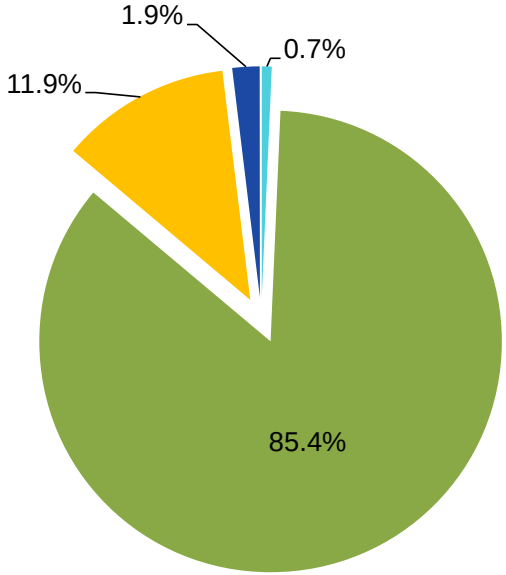
Total usage: 82 acre-feet

Groundwater



Total usage: 3,514 acre-feet

Total



Total usage: 3,596 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

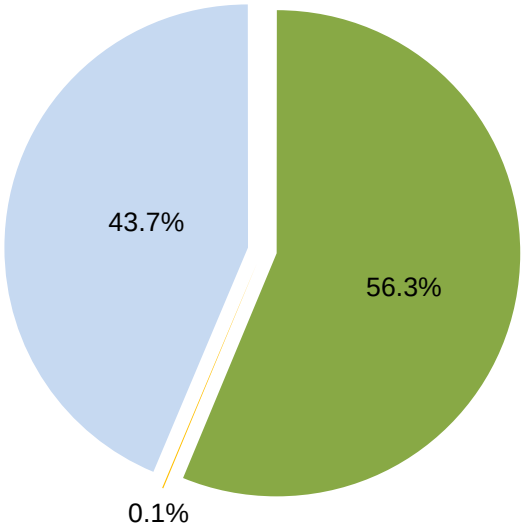
Note: Only categories with usage above 0.1% are shown.

NORTHEAST NEW MEXICO
REGIONAL WATER PLAN 2016

Harding County Water Demand, 2010

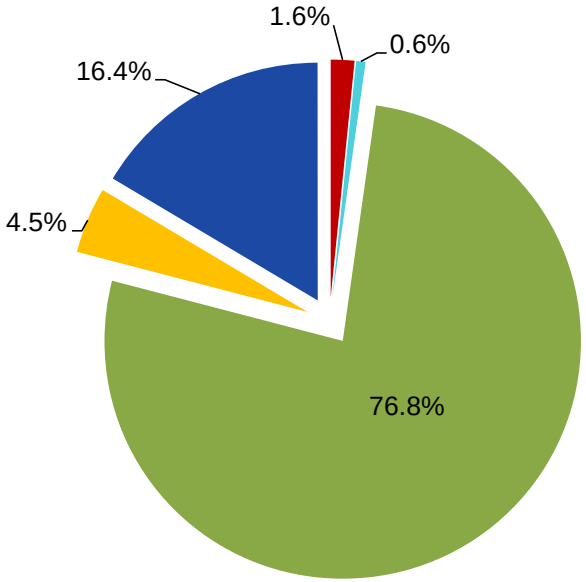
Figure 6-1b

Surface Water



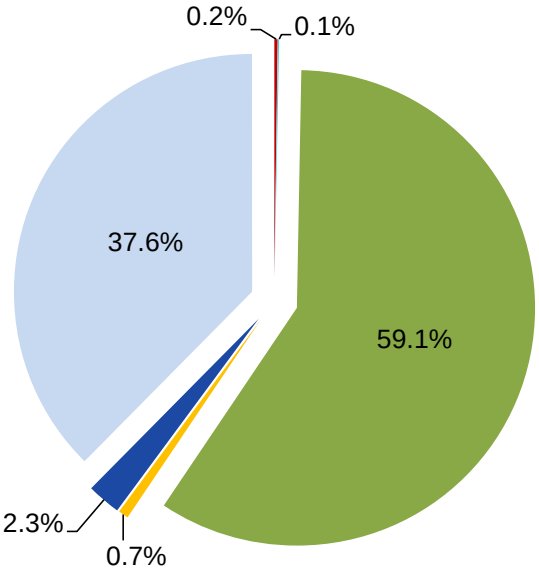
Total usage: 64,359 acre-feet

Groundwater



Total usage: 10,343 acre-feet

Total



Total usage: 74,702 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

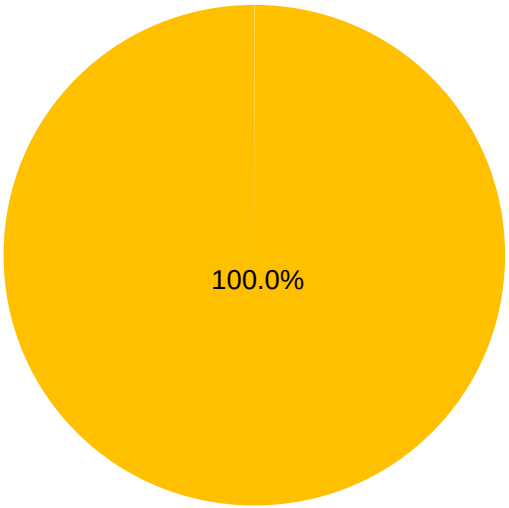
Note: Only categories with usage above 0.1% are shown.

NORTHEAST NEW MEXICO
REGIONAL WATER PLAN 2016

Quay County Water Demand, 2010

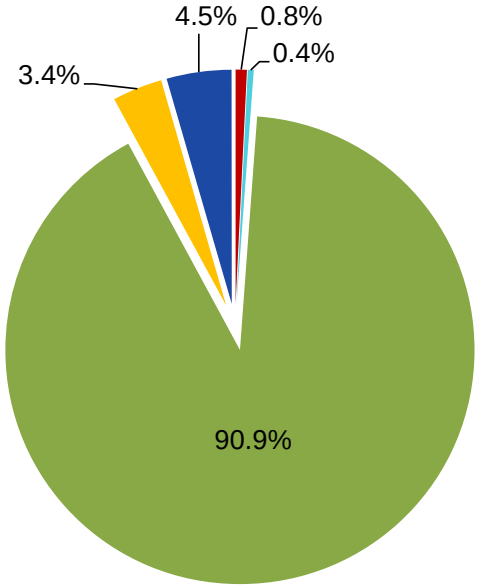
Figure 6-1c

Surface Water



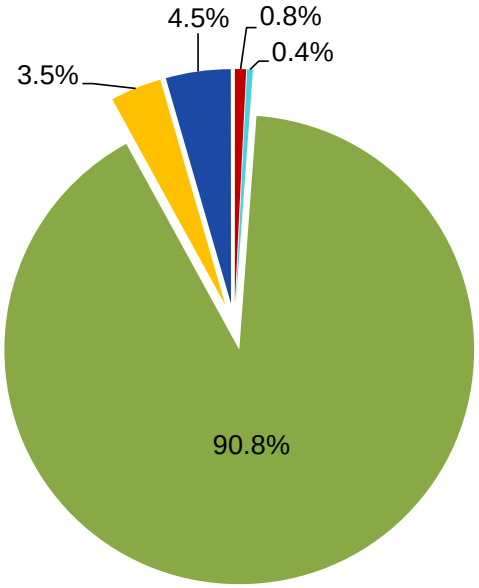
Total usage: 174 acre-feet

Groundwater



Total usage: 183,856 acre-feet

Total



Total usage: 184,029 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

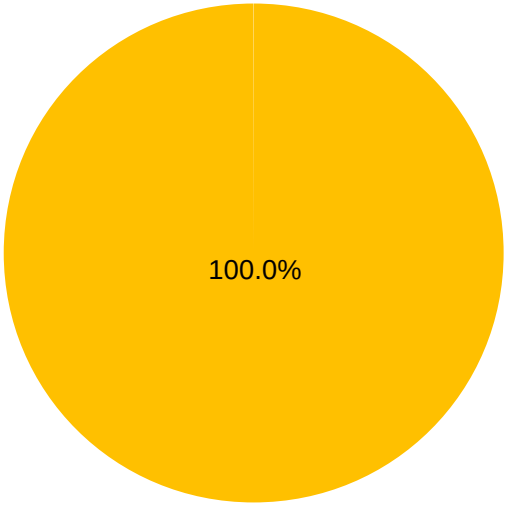
Note: Only categories with usage above 0.1% are shown.

Figure 6-1d

NORTHEAST NEW MEXICO
REGIONAL WATER PLAN 2016

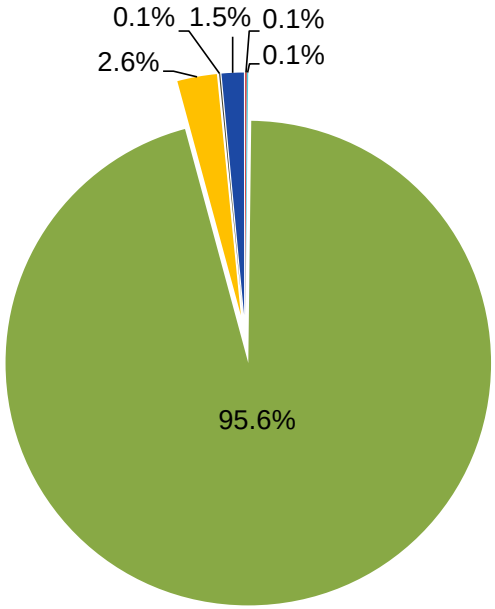
Curry County Water Demand, 2010

Surface Water



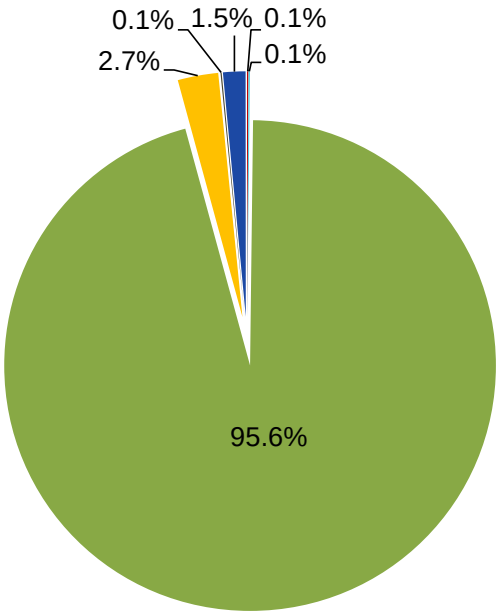
Total usage: 84 acre-feet

Groundwater



Total usage: 194,555 acre-feet

Total



Total usage: 194,639 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

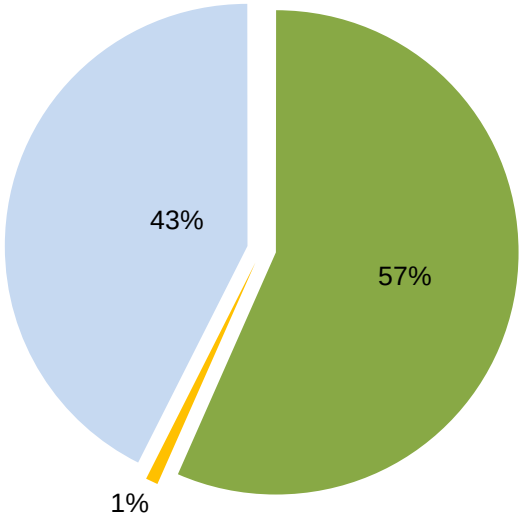
Note: Only categories with usage above 0.1% are shown.

NORTHEAST NEW MEXICO
REGIONAL WATER PLAN 2016

Roosevelt County Water Demand, 2010

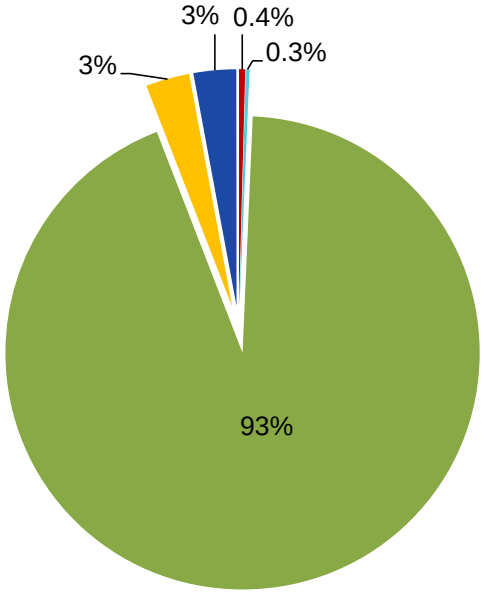
Figure 6-1e

Surface Water



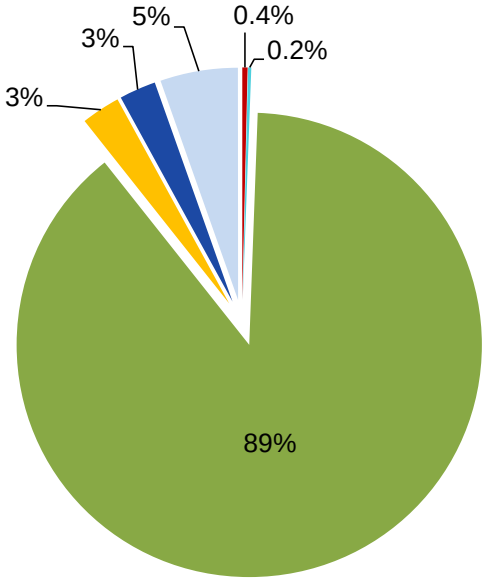
Total usage: 67,136 acre-feet

Groundwater



Total usage: 461,312 acre-feet

Total



Total usage: 528,448 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

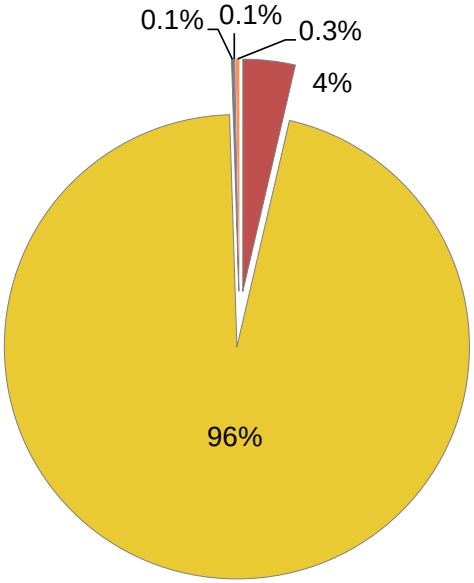
Note: Only categories with usage above 0.1% are shown.

Figure 6-1f

NORTHEAST NEW MEXICO
REGIONAL WATER PLAN 2016

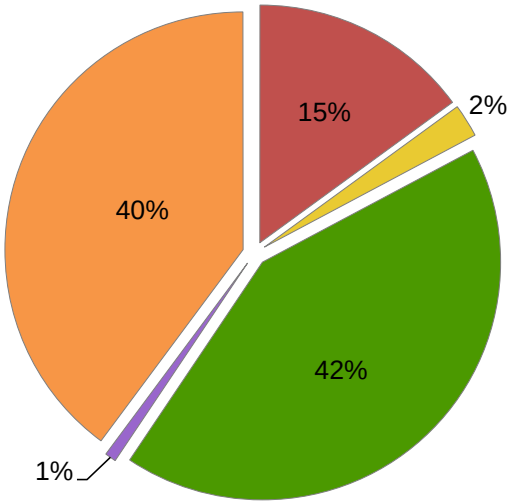
Total Regional Water Demand by Sector, 2010

Surface Water



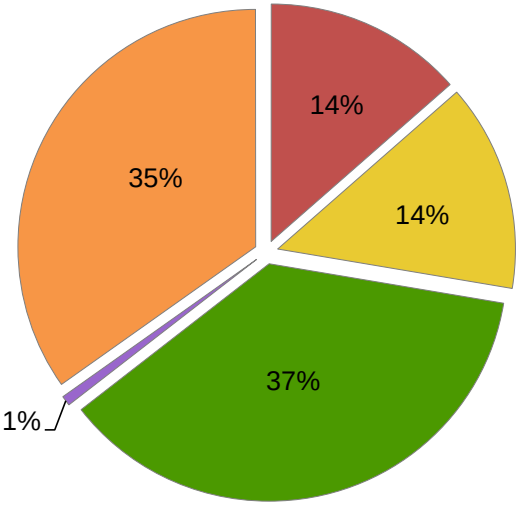
Total usage: 67,136 acre-feet

Groundwater



Total usage: 461,312 acre-feet

Total



Total usage: 528,448 acre-feet

Explanation

Union Quay Roosevelt
Harding Curry

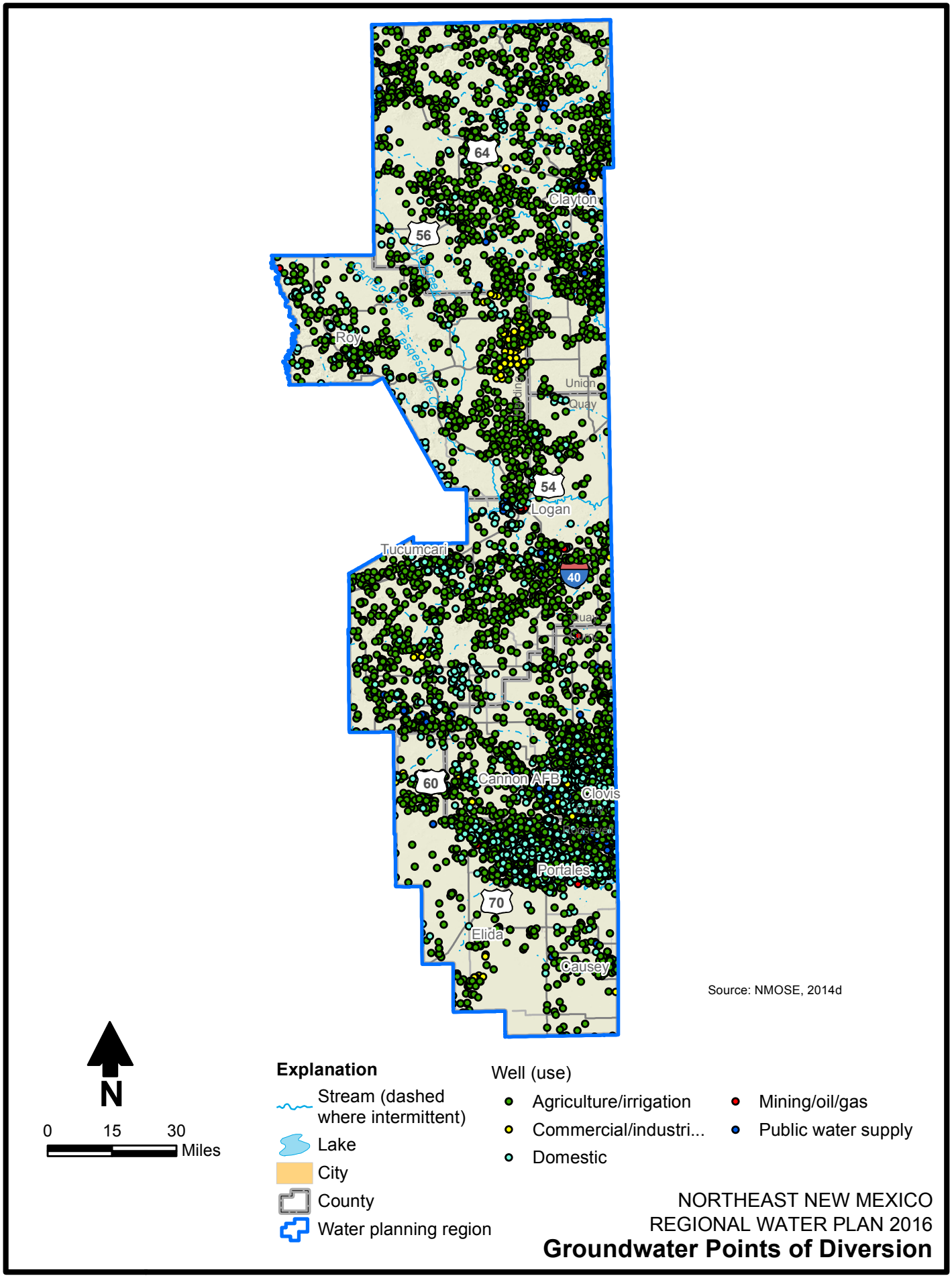
Source: Longworth et al., 2013

Note: Due to rounding, the percentages may not add to 100%.

Figure 6-1g

NORTHEAST NEW MEXICO
REGIONAL WATER PLAN 2016

Total Regional Water Demand by County, 2010



S:\PROJECTS\WR12.0165_STATE_WATER_PLAN_2012\GIS\MXDS\FIGURES_2016\NORTHEAST_NEW_MEXICO\FIG6-2_POINTS_OF_DIVERSION.MXD 6/10/2016

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. There are also some unquantified additional categories of water use, including riparian evapotranspiration and instream flow.

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

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

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

6.2 Demographic and Economic Trends

To project future water demands in the region, it is important to first understand demographics, including population growth and economic and land use trends as detailed below. The 2013 populations of the five counties were (U.S. Census Bureau, 2014a):

- Union: 4,370
- Harding: 693
- Quay: 8,662
- Curry: 50,598
- Roosevelt: 19,955

While Union and Quay counties showed population declines between 2010 and 2013, Harding and Roosevelt counties remained stable and Curry County showed population growth (Table 3-1a).

As noted in Table 3-1d, livestock is one of the most valuable agricultural commodities in all five counties, with the sale of cattle the most important in Union, Harding, and Quay, and dairy sales the most important in Curry and Roosevelt.

Specific information regarding the population and economic trends in each county is provided in Sections 6.2.1 through 6.2.5. 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 five counties; the list of interviewees is provided in Appendix 6-A. The information in these subsections was used to project population, economic growth, and future water demand, as presented in Sections 6.3 and 6.5.

6.2.1 Union County

The population of Union County declined 4 percent between 2010 and 2013. The town of Clayton comprises about 67 percent of the population of the County. Agriculture is the largest employer in Union County, and the population decline can be attributed partially to drought conditions.

While farmers still have access to groundwater, ranchers have had to downsize cattle herds. Acreage in farms decreased by 10 percent between 2007 and 2012, and the number of farms decreased by 7 percent. Between 2007 and 2012 irrigated acreage declined from 47,027 acres to 26,014 acres, a decrease of 44.7 percent. Land prices for both farmland and ranchland are increasing. Investors from outside the state, mostly Colorado, own a good deal of the agricultural land.

Though farming is a bigger part of the agricultural economy (in the form of corn grown for grain) in Union County than other counties in the region, livestock is still the largest revenue producer. More than 95 percent of the agricultural land is pastureland, and livestock sales accounted for 83 percent of agricultural sales in the county in 2012 (USDA NASS, 2014). However, drought has had a significant impact on cattle herds, causing them to drop from 20,000 to 5,000 head over the past three years.

The Union County economy has remained stable despite the drought, and commercial loan demand is healthy. Agriculture-related retail stores have suffered, but gross receipts tax collections are slowly recovering.

A major employer in Union County is the privately operated Northeastern New Mexico Detention Facility, which houses 600 prisoners. The prison could accommodate another 600 prisoners, which could increase employment by 200 jobs. The detention facility is the major source of non-agricultural jobs in the area.

Basic industries in Union County (those that employ a higher percentage than the state average and export goods or services outside of the local area) are agriculture and federal government civilian employment (Arrowhead Center, 2013).

The Union County Community Development Corporation is trying to bring new businesses to the 1,700-acre Clayton Industrial Park, including an ethanol refinery. The City of Clayton is looking for a company that would manufacture up to 200 million gallons of bioethanol annually from locally grown sorghum, combined with a water and power co-generation facility that would desalinate water. Farmers are switching from growing corn to growing sorghum or dryland grasses and could supply the raw material for the fuel.

The City of Clayton has provided infrastructure improvements for the industrial park, which was once farmland. It has ten wells, five of which are currently used for municipal and prison water supply. A recent infrastructure project has brought water and sewer service to the industrial park.

In May 2014, the New Mexico State Land Commission signed a lease agreement with a wind energy company for a 285-turbine wind farm in Union County that could eventually generate up to 500 megawatts of electricity. The wind farm would be on 50,000 acres of private and state trust land and would be built in two phases, beginning in 2015. The first phase could create 400 construction jobs and 20 permanent jobs.

Clayton High School enrollment is declining, and the County is struggling to provide jobs to younger people other than jobs at the prison. Most college students do not return to Union County after receiving their degrees because of the lack of well-paying professional jobs.

6.2.2 Harding County

Harding County is the most sparsely populated county in New Mexico, with only 0.3 persons per square mile. Population remained stable from 2010 to 2013, with a drop of only 2 persons (695 to 693). Harding County relies almost totally on ranching, having no irrigated cropland, and has few non-agriculture related businesses or jobs. In 2012, 97 percent of the agricultural land was pastureland, and 98 percent of agricultural sales were from livestock (USDA NASS, 2014).

Despite the drought, the number of ranches actually increased by 20 percent between 2007 and 2102, and the total number of acres increased by 10 percent. The average acreage of a ranch, however, decreased by 9 percent. Government payments to farmers participating in agricultural support programs increased by 71 percent (USDA NASS, 2014). County ranchers, who once kept 35,000 head of cattle, had 12,700 head in 2012 and only about 10,000 in 2014.

Compared with other counties, little gross receipts tax is being generated in Harding County. According to the Census Bureau's American Community Survey, 50 percent of Harding county residents are not in the labor force and 30 percent of the population is over 65 years of age (U.S. Census Bureau, 2014b). The Village of Roy is the largest population center, with a 2012 population of 238, down 21 percent from 2000 (U.S. Census Bureau, 2014a).

Basic industries in Harding County (those that employ a higher percentage than the state average and export goods or services outside of the local area) are agriculture, mining, and transportation (Arrowhead Center, 2013).

Young people are leaving the County. In 2012 the average age of a rancher in Harding County was 64, and only 16 producers were under the age of 45 (USDA NASS, 2014).

Some ranchland is being leased to neighboring ranchers, but there is a trend to absentee landowners in the County. Some of the land is leased for carbon dioxide production as Bravo Dome, a huge carbon dioxide gas field, lies beneath Harding County.

Harding County has been inducted into the MainStreet program as a 501(c)(3) non-profit organization and includes the Villages of Roy and Mosquero and the Community of Solano along a 19-mile stretch of New Mexico Highway 39. In the two years of the organization’s existence, Harding County received approximately $200,000 in funding for professional services, training, and education. The goal is to re-invigorate the Harding County economy, and a comprehensive urban redevelopment plan is underway (Crews, 2015).

6.2.3 Quay County

The population of Quay County in 2013 was 8,662, 4.2 percent lower than in 2010. The City of Tucumcari, with a population of 5,152 in 2012, accounted for 59 percent of the population of the County.

Of the five counties in the Northeast New Mexico Water Planning Region, Quay has been the most affected by the drought. It relies on the Arch Hurley Conservancy District, which is supplied by water from Conchas Lake. The District released water in April 2014 for the first time in three years, as drought conditions had kept Conchas Lake's level below the elevation at which allocations to Arch Hurley customers could be allowed. It has been at least 12 years since farmers received a full allocation of water, and many are switching to dryland farming.

Most of the agricultural land (85 percent) is devoted to pasture. Wheat is the primary crop in terms of planted acreage. Livestock sales (cattle and calves) accounted for 94 percent of agricultural revenue in Quay County in 2012 (USDA NASS, 2014).

In recent years, 25 percent of the irrigated land in Quay County has been enrolled in the federal Conservation Reserve program. This is a long-term commitment, taking land out of agricultural production for 10, 15, or 20 years. As a result of enrollments in the conservation program, government payments to farmers participating in the program increased by 25 percent between 2007 and 2012 (USDA NASS, 2014). The number of farms decreased by 13 percent between 2007 and 2012, but the acreage in farms increased by 2 percent. Between 2007 and 2012 irrigated acreage declined from 18,781 acres to 6,966 acres, a decrease of 62.9 percent.

Basic industries in Quay County (those that employ a higher percentage than the state average and export goods or services outside of the local area) are agriculture, accommodation and food service, and retail trade (Arrowhead Center, 2013).

The City of Tucumcari, which is located on Route 66, and Quay County are working to attract more tourists. The City was hoping to get a license from the state for a horseracing track, but that did not materialize.

Several retail stores in Tucumcari have closed. Farm equipment suppliers are closing down as well. One logistics company from Arizona did locate on I-40, providing 25 new jobs. The school enrollment continues to decline, and the majority of young people go to Texas after high school or college.

The residential market is stagnant and no new sub-divisions or houses have been constructed in at least five years. Ranch loans have been the one bright spot in the lending arena. Ranches are selling because older ranchers are finding it hard to operate in the drought and their children are not interested in taking over. The trend is toward absentee owners; 90 percent of buyers are from outside the state, primarily Texas.

6.2.4 Curry County

The population of Curry County was 50,598 in 2013, an increase of 4.6 percent from 2010. The City of Clovis, which grew by the same percentage, comprises 78 percent of the County population.

Milk from cows is the primary generator of agricultural sales in the County. However, the number of dairy farms in Curry County decreased substantially. According to the 2012 Census of Agriculture, there were 35 dairy farms in Curry County in 2012, 6 more than in 2007, but the number dropped to 26 in 2014. The price of feed currently exceeds the price of milk, and in Curry County, dairy farmers have to drill much deeper to access well water than in the past, adding additional expense.

The total number of farms decreased by 12 percent between 2007 and 2012 (USDA NASS, 2014). Between 2007 and 2012 irrigated acreage declined from 72,924 acres to 62,175 acres, a decrease of 14.7 percent. Many crop farmers are selling their land, usually to neighbors, or going to dryland farming. Some farmers are switching from corn, which is very water intensive, to sorghum or hay, but many farmers are getting by on crop insurance payments rather than crop sales. The sorghum and hay will be used as feed for dairy cows because corn is too expensive, especially when milk prices are low.

Domestic wells in the southern part of Curry County are drying up, and water is being hauled in. This makes it difficult for people to sell their houses.

A local bank reports that 25 percent of the Bank's loan portfolio is in agriculture, but there is slack loan demand because of the drought. Agricultural loans in Curry County are usually made to ranchers to buy cattle, but they are not buying due to high prices and continued drought.

Complementary to the numerous dairies, is the Southwest Cheese plant in Clovis, which employs 350 people.

A bright spot in the Curry County economy is Cannon AFB. The base is expanding and there is a need for new housing, which is being privatized. This will bring construction jobs to Curry County. In 2014 the base employed 5,700 enlisted personnel and 6,900 total personnel.

Basic industries in Curry County (those that employ a higher percentage than the state average and export goods or services outside of the local area) are federal civilian and military employment, agriculture, retail trade, and accommodation and food service (Arrowhead Center, 2013).

If the long-planned Tres Amigas transmission line gets built, it will bring 40 to 50 construction jobs. This would also provide a boost for wind farms in the entire Northeast New Mexico Water Planning Region. While wind energy will be an important economic alternative for all the counties, most of the jobs created will be just short-term construction employment, with few permanent jobs. Many agricultural producers are looking to wind turbines to generate revenue, but these are dependent on the transmission line being built.

6.2.5 Roosevelt County

The population of Roosevelt County was 19,955 in 2013, a 0.5 percent increase from 2010. The City of Portales contributes 63 percent of the County's population.

The number of farms in Roosevelt County decreased by 22 percent between 2007 and 2012, and acreage in farms dropped by 10 percent. However, the average size of farms increased by 16 percent. Most of the agricultural land in the County (78 percent) was in pastures; the remainder was devoted to crops. Between 2007 and 2012 irrigated acreage declined from 70,206 acres to 46,082 acres, a decrease of 34.4 percent. Government payments to farmers participating in agricultural support programs actually dropped between 2007 and 2012 (USDA NASS, 2014).

Livestock accounted for 93 percent of agricultural product sales in 2012. Milk for cows was the largest revenue source.

The number of operating dairies in Roosevelt County is one-third of what it was in 2010, and there is no demand from dairy farmers for loans. Cotton, which at one time was an important crop, is not being planted because of lack of irrigation water. Hay is being trucked in from Colorado because it is too expensive to grow in eastern New Mexico.

Like Curry County, the health of the Roosevelt County economy relies heavily on Cannon AFB. Portales is only 10 miles from the base and local businesses are dependent on Air Force personnel for purchases. Restaurants also rely on the 5,855 students at Eastern New Mexico University for business. The Roosevelt County Community Development Corporation is trying to bring in more entertainment such as a movie theater and other quality of life improvements that would cater to both the students and Air Force personnel. The University is building a new football stadium in Portales.

The economy suffered a setback in 2013 when the Sunland Inc. peanut-processing plant in Portales closed after a salmonella outbreak in 2012. The plant, which had been a major employer, has been sold to Canada’s Golden Boy Foods, which has not yet reopened the facility. Local peanut farmers have not planted a crop because of fear of not being able to sell their peanuts. Other industrial jobs are provided by a Coca-Cola bottling plant in Portales.

The rental market is strong because Air Force personnel prefer to rent than buy. Several four-plexes are being constructed, and in Portales a new 40-unit rental subdivision was recently approved.

The County is very interested in encouraging wind farms, but as in Curry County, the lack of transmission line is a major impediment. Gross receipts taxes were down 3.5 percent in 2014 after dropping 5 percent in 2013. Most of the graduates of Eastern New Mexico University leave the area after graduation because of the lack of professional jobs.

Basic industries promote local economic growth by bringing jobs and income into the community. The basic industries in Roosevelt County are agriculture and state government (Arrowhead Center, 2013).

6.3 Projected Population Growth

The population projections for the 2007 Regional Water Plan encompassed two forecasts, a high and a low, each covering the period from 2000 through 2040. The Bureau of Business and Economic Research (BBER) at the University of New Mexico (UNM) prepared county-level population forecasts using data and historical trends from 1960 up to the 2000 Census. These BBER projections were almost equivalent to the low projections that were included in the adopted plan for Union and Harding counties, but were lower than the low projections for Quay, Curry, and Roosevelt counties (the projections that were included in the adopted plan were based on historical trends, more recent trends, and new and pending economic activity). Compared to the actual 2010 population (U.S. Census Bureau, 2014a), the 2007 water plan high growth scenarios for all three counties were extremely optimistic; even the low growth scenarios for every county except Union were also too high (Table 6-2).

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

County	2007 Regional Water Plan [a]		2010 U.S. Census [b]
	High	Low	
Union	4,800	4,300	4,549
Harding	1,000	800	695
Quay	12,300	10,400	9,041
Curry	54,600	51,600	48,376
Roosevelt	24,400	21,100	19,846
Total Region	97,100	88,200	82,507

[a] DBS&A, 2007

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

For the updated population projections through 2060 (Table 6-3, Appendix 6-B), two population forecasts were developed: one based on a moderately optimistic view of the economy for this region over the long-term and one that portrays a more pessimistic picture. The low population projections incorporate factors that have been affecting New Mexico since 2000, including drought, continuing recession, job losses, and most recently, out-migration. The high population projections rely on Cannon AFB remaining open through 2060, with a stable or slightly increasing population of military personnel, dependents, and civilian contractors.

Table 6–3. Northeast New Mexico 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
Union	High	0.75	0.50	0.29	0.22	0.06
	Low	0.11	0.26	0.06	0.10	0.04
Harding	High	–0.14	–0.15	–0.45	–0.24	–0.49
	Low	–0.29	–0.45	–0.31	–0.83	–0.81
Quay	High	0.07	0.11	0.05	0.05	0.11
	Low	–0.50	–0.35	–0.12	–0.12	–0.12
Curry	High	1.41	1.44	1.06	0.71	0.37
	Low	0.82	0.77	0.58	0.51	0.44
Roosevelt	High	1.15	1.29	0.95	0.53	0.64
	Low	0.53	0.29	1.02	0.81	0.66

Source: Poster Enterprises, 2014

b. Projected Population

County	Projection	Population					
		2010	2020	2030	2040	2050	2060
Union	High	4,549	4,900	5,150	5,300	5,420	5,450
	Low	4,549	4,600	4,720	4,750	4,800	4,820
Harding	High	695	685	675	645	630	600
	Low	695	675	645	625	575	530
Quay	High	9,041	9,100	9,200	9,250	9,300	9,400
	Low	9,041	8,600	8,300	8,200	8,100	8,000
Curry	High	48,376	55,650	64,200	71,350	76,600	79,450
	Low	48,376	52,500	56,700	60,100	63,240	66,100
Roosevelt	High	19,846	22,250	25,300	27,800	29,320	31,240
	Low	19,846	20,925	21,550	23,840	25,850	27,600

Source: Poster Enterprises, 2014

While drought affects the agricultural sector the most profoundly, it also affects retailers such as agricultural equipment and supply merchants who sell to farmers and ranchers, and the low population projections reflect the ripple effect of a possible long-term drought in New Mexico.

Furthermore, a substantial percentage of farmers and ranchers in the planning region are aged 50 to 70 (New Mexico has the highest average age for farmers and ranchers in the country—60.5 years [USDA NASS, 2014]). If drought conditions prevent younger people from pursuing agriculture as a livelihood, they may leave the region to pursue work in areas with more employment opportunities. Northeast New Mexico's proximity to Texas facilitates out-migration, especially among college graduates who can benefit from the greater job opportunities in the neighboring state.

The dairy industry has been an integral part of the economy of the Northeast New Mexico Water Planning Region for all of the twentieth century. The region has never recovered from the drought that began in 2009, and while 2014 may be better due to increased milk prices, systemic problems still exist. Some dairies will likely eventually move from the Northeast New Mexico region to the Lower Pecos Valley Water Planning Region, specifically Chaves County, because the groundwater supply is more reliable there.

The dairies that remain in the Northeast New Mexico region are well managed. A high altitude environment is conducive to producing high-quality milk, so there will always be a demand for New Mexico milk. Also, advances in agricultural technology have led to higher production levels from the same number of cows. Therefore, it is likely that the number of dairy cows will not return to the 2010 level.

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

- *Union County:* The population of Union County is projected to increase slightly in both the high and low growth scenarios. However, the projected population in both scenarios is below the 2012 BBER forecast and reflects the negative growth that has occurred since 2010. The economy relies mainly on the agricultural sector, and in the absence of growth in the industrial or commercial sectors, it will be difficult to halt out-migration.

- *Harding County:* Population is projected to decline through 2060 under both the high and low scenarios. Harding County has an older demographic profile than the other counties in the region, and as deaths exceed births over the next 40 years, the population decline may accelerate. The Harding County MainStreet designation is expected to be a source of economic activity; however, in-migration is not projected. The low scenario is in line with the BBER's 2012 projection.

- *Quay County:* The population of Quay County is projected to continue to decline under the low scenario, as it has done since 2010. The 2012 revised BBER forecast also anticipated a slow but steady population decline, but not as much as this projection. With

agriculture being the backbone of the economy, the county is suffering greatly from the drought. The low projection is predicated on a continuing severe drought and out-migration of younger residents. The high projections anticipate a lessening of the effects of the drought as farmers switch to dryland farming and therefore indicate minimal growth spurred by an improvement in the agricultural economic climate.

- *Curry County:* The population of Curry County is projected to grow in both the high and low scenarios. The growth is dependent on the continuing presence of Cannon AFB through 2060, with the high growth projection anticipating increases in personnel and the low growth projection anticipating a stable number of personnel. The federal government cannot forecast the future of military bases 45 years out and it is possible that Cannon will close before 2060, but neither projection takes this into account. The high projection also anticipates a recovery in the dairy industry. The high projection is more optimistic than the BBER's 2012 projection, while the low projection is slightly less optimistic than the BBER projection through 2060.

- *Roosevelt County*: Both the high and low scenarios anticipate population growth in Roosevelt County, which benefits from the presence of a university and proximity to Cannon AFB. The high growth scenario anticipates a partial recovery in the dairy industry and the re-opening of the peanut processing plant. The high projections generally track the 2012 BBER forecast, except for a bit higher projection for 2060.

6.4 Water Conservation

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

To develop demand projections for the region, some simplifying assumptions regarding conservation have been made. These assumptions were made only for the purpose of developing an overview of the future supply-demand balance in the region and are not intended to guide policy regarding conservation for individual water users. The approach to considering conservation in each category of water use for developing water demand projections is discussed below. Specific recommendations for conservation programs and policies for the Northeast New Mexico 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.

For the Northeast New Mexico region, current per capita use in all 5 counties is between 130 and 200 gpcd (Table 6-4), so their future per capita use is assumed to be reduced to 130 gpcd. In the projections, these reductions are phased in over time.

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

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

OSE Declared Groundwater Basin(s) [a]	Water Supplier [b]	Population	Per Capita Use (gpcd)	Withdrawals (acre-feet)	
				Surface Water	Groundwater
Union County					
Clayton	Clayton Municipal Supply	2,401	200	0	538
	Des Moines Water System	200	111	0	25
	Grenville Water System	27	58	0	2
	Union County public water supply totals	2,628		0	564
	County-wide public water supply per capita use [c]		192		
Clayton Tucumcari	Rural self-supplied homes (Canadian)	1,921	80	0	172
	Union County domestic self-supplied totals	1,921		0	172
	County-wide domestic self-supplied per capita use [c]		80		
Harding County					
Tucumcari	Mosquero Water System	106	164	0	19
	Roy, Village of	312	142	0	50
	Harding County public water supply totals	418		0	69
	County-wide public water supply per capita use [c]		148		
Canadian River Clayton Tucumcari	Rural self-supplied homes (Canadian)	277	80	0	25
	Harding County domestic self-supplied totals	277		0	25
	County-wide domestic self-supplied per capita use [c]		80		
Quay County					
Clayton	Nara Visa Water Co-Op	69	97	0	7
Fort Sumner	House Water System	88	126	0	12

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

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

[b] Rural self-supplied homes are located in river basin specified in parentheses.

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

gpcd = Gallons per capita per day

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

OSE Declared Groundwater Basin(s) [a]	Water Supplier [b]	Population	Per Capita Use (gpcd)	Withdrawals (acre-feet)	
				Surface Water	Groundwater
Quay County (cont.)					
Tucumcari	Hills Village Water System	114	67	0	9
	Liberty MDWUA	230	100	0	26
	Logan Water System	1,025	391	0	449
	Rad Water Users Coop	470	170	0	90
	San Jon Water Supply	308	147	0	51
	Tucumcari Water System	6,000	157	0	1,057
	Quay County public water supply totals	8,304		0	1,701
	County-wide public water supply per capita use [c]		183		
Clayton Curry Tucumcari	Rural self-supplied homes (Canadian)	656	80	0	59
Fort Sumner	Rural self-supplied homes (Pecos)	81	80	0	7
	Quay County domestic self-supplied totals	737		0	66
	County-wide domestic self-supplied per capita use [c]		80		
Curry County					
Curry	Cannon Air Force Base	2,301 [d]	312 [d]	0	804
	Desert Ranch Water System	95	139	0	15
	Grady Water System	98	147	0	16
	Ideal Mobile Home Park	84	100	0	9
	Longhorn Estates Water System	240	100	0	27
	Melrose Water System	800	199	0	179

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

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

[b] Rural self-supplied homes are located in river basin specified in parentheses.

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

[d] According to Cannon Air Force Base (2016) the population served should be reported as over 4,200 people. With this higher population the gpcd would be much lower.

gpcd = Gallons per capita per day

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

OSE Declared Groundwater Basin(s) [a]	Water Supplier [b]	Population	Per Capita Use (gpcd)	Withdrawals (acre-feet)	
				Surface Water	Groundwater
Curry County (cont.)					
Curry (cont.)	Sams Mobile Home Park [e]	100	100	0	11
	Tall Pines Water Association [e]	42	61	0	3
	Texico Water System	1,050	156	0	184
	Turquoise Estates Wtr Co-Op - Clovis	165	84	0	16
Curry Portales	EPCOR *formerly* NM American Water Co. - Clovis	36,771	169	0	6,955
	Curry County public water supply totals	41,746		0	8,219
	County-wide public water supply per capita use [c]		176		
Curry	Rural self-supplied homes (Canadian)	995	100	0	111
Curry Portales	Rural self-supplied homes (Southern High Plains)	5,635	100	0	631
	Curry County domestic self-supplied totals	6,630		0	743
	County-wide domestic self-supplied per capita use [c]		100		
Roosevelt County					
Causey Lingo	Causey Water Association	50	99	0	6
	Dora Water Assn.	160	179	0	32
	Elida Water System	183	230	0	47
Portales	Floyd Water Co-Op	350	46	0	18
	Portales Water System	14,033	141	0	2,215
	Roosevelt County Water Co-op	3,500	147	0	577
	Roosevelt County public water supply totals	18,276		0	2,895
	County-wide public water supply per capita use [c]		142		

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

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

[b] Rural self-supplied homes are located in river basin specified in parentheses.

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

[e] Groundwater basin assumed based on geographic location of water supplier.

gpcd = Gallons per capita per day

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

OSE Declared Groundwater Basin(s) [a]	Water Supplier [b]	Population	Per Capita Use (gpcd)	Withdrawals (acre-feet)	
				Surface Water	Groundwater
Roosevelt County (cont.)					
Fort Sumner Roswell	Rural self-supplied homes (Pecos)	204	100	0	23
Causey Lingo Fort Sumner Portales	Rural self-supplied homes (Southern High Plains)	1,366	100	0	153
	Roosevelt County domestic self-supplied totals	1,570		0	176
	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] Rural self-supplied homes are located in the river basin specified in parentheses.

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

gpcd = Gallons per capita per day

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 Northeast New Mexico 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 very 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 in the Northeast New Mexico region it accounted for only 5 percent of total water use in 2010. This demand is largely for evaporation from Ute Reservoir in Quay County. To reduce usage in this category, some areas outside of the region have considered aquifer storage and recovery to replace some reservoir storage, and it may also be possible in some circumstances to gain some reduction in evaporation by storing more water at higher elevations or constructing deeper reservoirs with less surface area for evaporation. Since Ute Reservoir will be used for municipal and industrial water supply in the future, aquifer storage and recovery is not likely to replace reservoir storage in this region. Due to the legal, financial, and other complexities of implementing evaporation reduction techniques, no conservation savings are assumed in developing the reservoir evaporation demand projections for this region.

6.5 Projections of Future Water Demand for the Planning Horizon

To develop projections of future water demand a consistent method was used statewide. Section 6.5.1 provides a comprehensive discussion of the methods applied consistently throughout the state to project water demand in all the categories reported in the *New Mexico Water Use by Categories* reports, and some of the categories may not be applicable to the Northeast New Mexico region. The projections of future water demand determined using this consistent method, as applicable, for the Northeast New Mexico 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 Northeast New Mexico 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. One factor that may have a significant impact in the future is the rising cost of pumping wells as water levels decline as aquifers go dry.

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 and carbon dioxide). 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 Northeast New Mexico Projected Water Demand

Table 6-5 summarizes the projected water demands for each water use category for the Northeast New Mexico region, which were developed by applying the methods discussed in Section 6.5.1. As discussed in Section 6.3, population is projected to increase slightly under the low projection and increase at a greater rate for the high growth scenario. The total projected water demand in the county in 2060 ranges from 480,867 to 535,341 acre-feet per year. Surface water supplies may be considerably lower in drought years, as discussed in Section 5.5.2, but the demand for water does not necessarily decrease when the supply is diminished.

Demand in the *public water supply* category is projected to increase in Union, Quay, Curry, and Roosevelt counties under the high scenario, proportional to the increasing population projections, while public water supply demand in Harding County is projected to remain at the 2010 level. Use in this category is not projected to decline proportionally to the projections indicating declining population, because it is anticipated that existing water rights and domestic wells will continue to be used at the 2010 administrative supply level.

Projected water demand in the *commercial* and *domestic* categories is assumed to be proportional to the population growth rates, which are anticipated to increase in Union, Quay, Curry, and Roosevelt counties. The low projections for all counties assume current levels of use for the domestic and commercial categories.

Water use in all five counties occurs primarily in the *agricultural* sector. For the low projections, the current observed trend in declining agriculture is expected to continue for the short-term, through 2030. Many farmers are taking their land out of production and into federal conservation programs for periods of 10 to 20 years. It is possible that drought will continue over a longer-term, but 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. Some farmers may adapt by switching to dryland farming and planting less water intensive crops. It would not be prudent to assume that there is no demand for agricultural water in the future, just because there is currently a drought and recession that is driving a decline. It is important to note that water levels are declining in the Northeast New Mexico region, especially in the Ogallala Aquifer, and the available water supplies are not expected to meet the irrigated agriculture water demand projections shown on Table 6-5 through 2060. The table shows projected demand, but actual water use will be limited by the volume of available groundwater that remains.

Table 6-5 Projected Water Use, 2020 through 2060
Northeast New Mexico Water Planning Region

Use Sector	Projection	Water Use (acre-feet)					
		2010 [a]	2020	2030	2040	2050	2060
Union County							
Public water supply	High	564	604	627	635	637	640
	Low	564	570	582	583	585	587
Domestic (self-supplied)	High	172	185	195	200	205	206
	Low	172	174	178	180	181	182
Irrigated agriculture	High	68,486	68,486	68,486	68,486	68,486	68,486
	Low	68,486	54,789	58,213	58,213	61,637	65,062
Livestock (self-supplied)	High	1,608	884	1,126	1,286	1,367	1,528
	Low	1,608	724	884	1,045	1,206	1,367
Commercial (self-supplied)	High	174	187	197	203	207	208
	Low	174	176	181	182	184	184
Industrial (self-supplied)	Low/High	0	0	0	0	0	0
Mining (self-supplied)	Low/High	0	0	0	0	0	0
Power (self-supplied)	Low/High	0	0	0	0	0	0
Reservoir evaporation	High	478	487	492	498	501	511
	Low	478	478	478	478	478	478
Harding County							
Public water supply [b]	Low/High	69	69	69	69	69	69
Domestic (self-supplied) [b]	Low/High	25	25	25	25	25	25
Irrigated agriculture	High	3,073	3,073	3,073	3,073	3,073	3,073
	Low	3,073	2,151	2,305	2,305	2,458	2,612
Livestock (self-supplied)	High	429	236	279	322	365	386
	Low	429	215	236	257	300	343
Commercial (self-supplied) [b]	Low/High	1	1	1	1	1	1
Industrial (self-supplied)	Low/High	0	0	0	0	0	0
Mining (self-supplied)	Low/High	0	0	0	0	0	0
Power (self-supplied)	Low/High	0	0	0	0	0	0
Reservoir evaporation	Low/High	0	0	0	0	0	0

[a] Actual use (Longworth et al., 2013)

[b] Population growth rates are used to project future water use in this sector. Where growth rates are negative, projected use is set at 2010 withdrawals. The withdrawals in 2010 represent water that has been put to beneficial use and is a valid water right. For planning purposes it is assumed that valid water rights are maintained and will be used in the future.

Table 6-5 Projected Water Use, 2020 through 2060
Northeast New Mexico Water Planning Region

Use Sector	Projection	Water Use (acre-feet)					
		2010 [a]	2020	2030	2040	2050	2060
Quay County							
Public water supply	High	1,701	1,711	1,727	1,732	1,736	1,749
	Low [b]	1,701	1,701	1,701	1,701	1,701	1,701
Domestic (self-supplied)	High	66	66	67	68	68	69
	Low [b]	66	66	66	66	66	66
Irrigated agriculture	Low/High	44,159	44,159	44,159	44,159	44,159	44,159
Livestock (self-supplied)	High	514	283	308	334	386	437
	Low	514	231	257	308	334	386
Commercial	High	164	165	167	168	169	171
(self-supplied)	Low [b]	164	164	164	164	164	164
Industrial (self-supplied)	Low/High	0	0	0	0	0	0
Mining (self-supplied)	Low/High	0	0	0	0	0	0
Power (self-supplied)	Low/High	0	0	0	0	0	0
Reservoir evaporation	High	28,097	28,370	28,643	28,970	29,406	29,625
	Low	28,097	28,097	28,097	28,097	28,097	28,097
Curry County							
Public water supply	High	8,219	9,374	10,557	11,359	11,764	12,122
	Low	8,219	8,874	9,449	9,821	10,086	10,445
Domestic (self-supplied)	High	743	855	986	1,096	1,176	1,220
	Low	743	806	871	923	971	1,015
Irrigated agriculture	High	167,172	167,172	167,172	167,172	167,172	167,172
	Low	167,172	125,379	133,738	142,096	150,455	150,455
Livestock (self-supplied)	High	6,471	3,883	4,530	4,853	5,177	5,824
	Low	6,471	3,236	3,559	3,883	4,530	5,177
Commercial	High	1,418	1,631	1,882	2,091	2,245	2,329
(self-supplied)	Low	1,418	1,539	1,662	1,762	1,854	1,938
Industrial (self-supplied)	Low/High	0	0	0	0	0	0
Mining (self-supplied)	Low/High	7	7	7	7	7	7
Power (self-supplied)	Low/High	0	0	0	0	0	0
Reservoir evaporation	Low/High	0	0	0	0	0	0

[a] Actual use (Longworth et al., 2013)

[b] Population growth rates are used to project future water use in this sector. Where growth rates are negative, projected use is set at 2010 withdrawals. The withdrawals in 2010 represent water that has been put to beneficial use and is a valid water right. For planning purposes it is assumed that valid water rights are maintained and will be used in the future.

Table 6-5 Projected Water Use, 2020 through 2060
Northeast New Mexico Water Planning Region

Use Sector	Projection	Water Use (acre-feet)					
		2010 [a]	2020	2030	2040	2050	2060
Roosevelt County							
Public water supply	High	2,895	3,239	3,658	3,985	4,165	4,423
	Low	2,895	3,049	3,133	3,442	3,700	3,935
Domestic (self-supplied)	High	176	197	224	247	260	277
	Low	176	186	191	211	229	245
Irrigated agriculture	High	186,021	186,021	186,021	186,021	186,021	186,021
	Low	186,021	130,215	139,516	139,516	148,817	158,118
Livestock (self-supplied)	High	5,219	2,870	3,131	3,392	3,392	4,175
	Low	5,219	2,349	2,870	3,131	3,131	3,653
Commercial	High	177	198	226	248	261	279
(self-supplied)	Low	177	187	192	213	231	246
Industrial (self-supplied)	Low/High	0	0	0	0	0	0
Mining (self-supplied)	Low/High	151	151	151	151	151	151
Power (self-supplied)	Low/High	0	0	0	0	0	0
Reservoir evaporation	Low/High	0	0	0	0	0	0
Total region							
Public water supply	High	13,449	14,998	16,638	17,780	18,371	19,003
	Low	13,449	14,264	14,935	15,617	16,141	16,737
Domestic (self-supplied)	High	1,182	1,329	1,497	1,635	1,734	1,797
	Low	1,182	1,257	1,331	1,405	1,473	1,533
Irrigated agriculture	High	468,911	468,911	468,911	468,911	468,911	468,911
	Low	468,911	356,693	377,930	386,289	407,526	420,405
Livestock (self-supplied)	High	14,241	8,156	9,374	10,188	10,686	12,350
	Low	14,241	6,753	7,807	8,625	9,502	10,926
Commercial	High	1,934	2,183	2,472	2,711	2,884	2,987
(self-supplied)	Low	1,934	2,066	2,200	2,321	2,433	2,533
Industrial (self-supplied)	Low/High	0	0	0	0	0	0
Mining (self-supplied)	Low/High	158	158	158	158	158	158
Power (self-supplied)	Low/High	0	0	0	0	0	0
Reservoir evaporation	High	28,575	28,856	29,135	29,468	29,907	30,135
	Low	28,575	28,575	28,575	28,575	28,575	28,575
Total regional demand	High	528,449	524,591	528,185	530,850	532,652	535,341
	Low	528,449	409,766	432,936	442,990	465,808	480,867

[a] Actual use (Longworth et al., 2013)

In Union County irrigated agriculture is projected to remain at the 2010 level for the entire forecast period in the high scenario, predicated on the drought ending. In the low scenario, an initial drop in water use is forecast, followed by gradual recovery, to 95 percent of the 2010 level by 2060. Livestock is projected to experience a significant initial drop in both scenarios, with recovery to 95 percent of the 2010 level by 2060 in the high scenario and 85 percent in the low scenario. Total recovery may not occur because ranching is not attractive as a career choice for younger people.

Irrigated agriculture demands in Harding County, which has almost no irrigated agriculture, are projected to remain at the 2010 level for the entire forecast period in the high scenario, predicated on the drought ending. This represents very minimal water usage. In the low scenario, irrigated agriculture will experience an initial drop and then gradually increase, reaching 85 percent of the 2010 level by 2060. Through 2020, livestock herds will remain at low levels because of high feed costs and high prices for breeding animals. By 2060, livestock will reach 90 percent of the 2010 level in the high scenario and 80 percent in the low projection. Harding County has a high percentage of ranchers who are over 65, and younger people are not attracted to ranching.

Quay County's irrigated agriculture has been the most adversely affected by the drought of any county in this region, according to USDA officials. Farmers are putting their land into conservation programs, and in the short-term, some farmers are switching to dryland farming. Since most water use for irrigated agriculture in Quay County is from surface water, water use is projected to remain at the 2010 level throughout the forecast period. Following an initial drop, livestock water usage will reach 85 percent of the 2010 level in the 2060 high scenario and 75 percent in the low scenario.

In Curry County irrigated agriculture demand is projected to remain at the 2010 level for the entire forecast period in the high scenario and to reach 90 percent of 2010 levels by 2060 in the low scenario. The County is highly reliant on the dairy industry, which is quite volatile because of the large swings in wholesale milk prices and feed. The trend in this industry is for more milk to be produced per cow, so livestock water use will not reach the 2010 level by 2060 in either the high or low scenarios.

Roosevelt County's irrigated agriculture demand is projected to remain at the 2010 level for the entire forecast period in the high scenario and reach 85 percent of 2010 use by 2060 in the low scenario. Irrigated agriculture comprises a relatively small percentage of agricultural sales. Similarly to Curry County, Roosevelt County is very dependent on the dairy industry; however, some dairies in Roosevelt County may move to Chaves County, which has more available groundwater. Therefore, a full recovery to the 2010 livestock water use level is not likely. For both projections a significant drop in water use is projected in 2020, followed by gradually

increasing water use to 2060, to 80 percent of 2010 usage in the high scenario and 70 percent in the low scenario.

None of the counties have any significant industrial, mining, or power generation activity, although Roosevelt County has one aggregate mining operation.

The Northeast New Mexico region projections include significant water use in the reservoir evaporation category due to the presence of Ute Reservoir. Since the lake will be used for municipal and industrial water supply in the future, reservoir evaporation is projected to either remain at the 2010 demand or increase slightly due to increased temperature. As discussed in Section 6.5.1, the projected demand is based on 2010 reservoir surface areas so that it can accurately be compared to the 2010 administrative water supply. The reservoir evaporation category is included for statewide accounting, but has little bearing on the supply available to the Northeast New Mexico region.

7. Identified Gaps between Supply and Demand

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

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

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

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

- As discussed in Section 6.5.1, the fluctuations in reservoir evaporation are expected to be much greater than the high/low projected range developed for this balance. When comparing the projected demands to the administrative water supply, which is based on 2010 water withdrawals, 2010 surface areas of reservoirs were used to avoid an

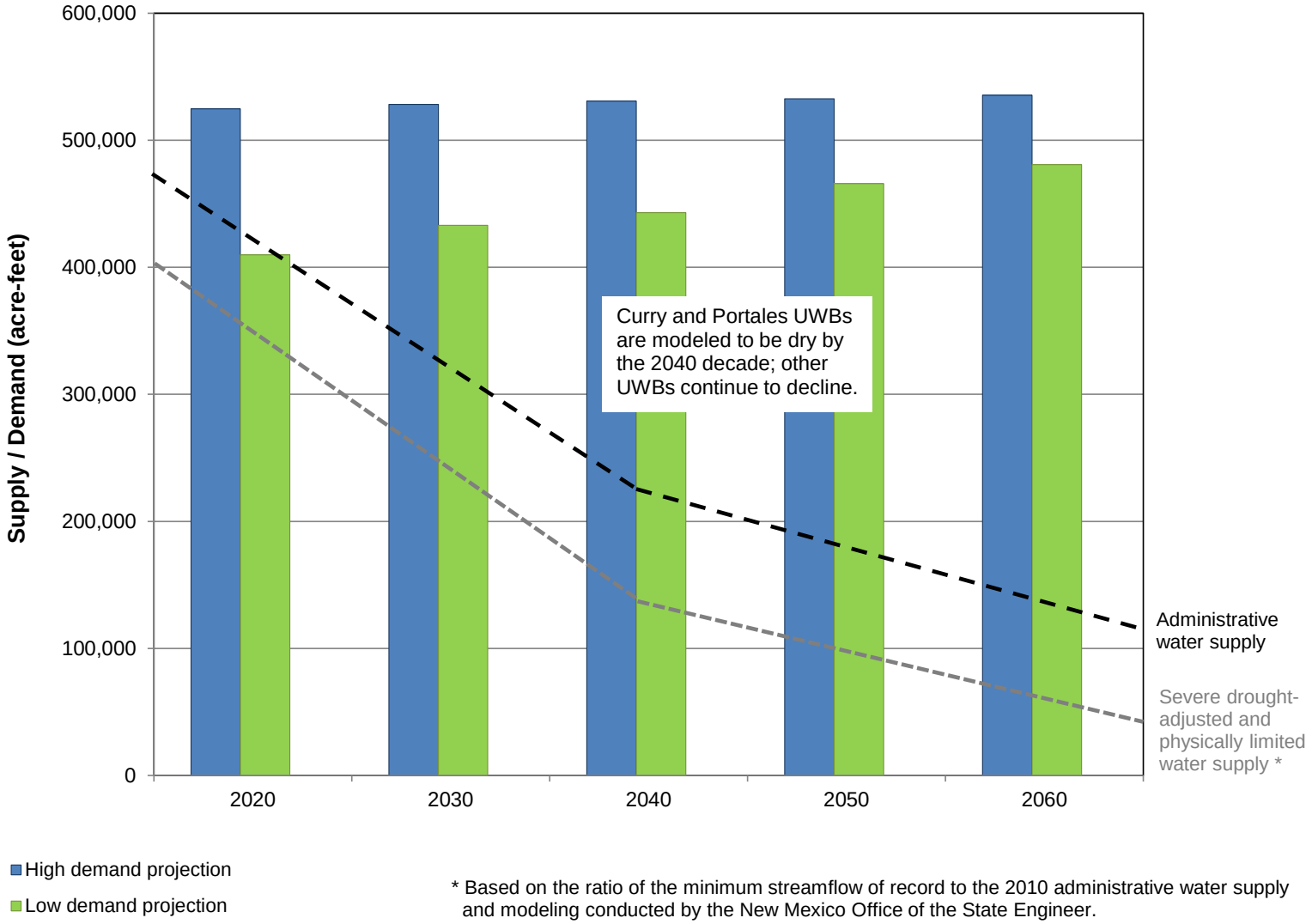
unrealistic scenario of excess available water. The actual amount of water that will be used for reservoir evaporation is dependent on the surface area of the reservoir and temperatures. During the first year of a drought when there is surface water in storage, the reservoir evaporation could be similar to 2010 use, but after subsequent years of drought, when storage and surface areas are lower, reservoir evaporation would be lower. As noted in Section 6.5.2, however, the reservoir evaporation category, while included for statewide accounting, has little bearing on the supply available to the Northeast New Mexico region.

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

- Besides quantitative estimates of supply and demand, numerous other challenges affect the ability of a region to have adequate water supplies in place. Water supply challenges include the declining water levels and limited groundwater resources in the region, 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 and Table 7-1 illustrate the total projected regional water demand under the high and low demand scenarios, and also show the administrative water supply and the drought-adjusted water supply. As presented in Section 5.5, the region's administrative water supply is 528,448 acre-feet based on 2010 withdrawals but is expected to decline to 139,328 acre-feet by 2060. The drought supply is estimated to be 63,946 acre-feet in 2060, or 12 percent of the 2010 administrative water supply. The decline rate through 2040 is calculated by using the projected negative water supply by 2060. The values presented in Figure 7-1 and Table 7-1 should be considered a schematic of the general trends and not a precise analysis of the aquifer behavior. Ideally, the numerical models could be used to simulate the decline in supply.

Future Northeast New Mexico 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, as discussed in Section 5.4, are predicted because of the region's reliance on groundwater basins with declining supplies. The estimated shortage in 2060 due to a prolonged drought is expected to range from 471,395 to 416,921 acre-feet.



* 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.

Figure 7-1

NORTHEAST NEW MEXICO
REGIONAL WATER PLAN 2016

Available Supply and Projected Demand

Table 7-1. Water Use and Estimated Availability in the Northeast New Mexico Water Planning Region

Source Type	Basin Area	2010 Estimated Water Use (ac-ft/yr)	2060 Estimated Water Availability (ac-ft/yr)	
			No Drought	One 20-Year Drought
Non stream-connected	Causey Lingo	17,749	14,717	12,587
	Clayton	67,749	41,389	33,259
	Curry County	178,663	0	0
	Portales	181,065	0	0
	Surface water (four basins)	2,690	2,690	81
Stream-connected	Surface water	64,446	64,446	1,933
	Groundwater connected to surface water	16,086	16,086	16,086
	Total	528,448	139,328	63,946
	Water use as a percentage of 2010 use		26%	12%

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 Northeast New Mexico region considered a variety of strategies for addressing these water management challenges. As discussed in Sections 5 and 7, groundwater sustainability is of great concern in the Northeast New Mexico region, as is the vulnerability of the surface water resources to drought, and there is a large gap between projected demands and drought supplies. Consequently, the Northeast New Mexico effort focused on a variety of strategies, including large water supply projects for the water stored in Ute Reservoir, regional aquifer mapping, water conservation, watershed restoration, and water reuse.

This RWP is building on the 2007 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 2007 *Northeast New Mexico Regional Water Plan* recommended the following strategies for meeting future water demand:

- Municipal conservation
- Agricultural conservation
- Groundwater management
- Rangeland conservation and watershed management
- Water rights protection
- Eastern New Mexico Rural Water System
- Infrastructure upgrades

- Planning for growth
- Dam construction

The steering committee reviewed each of the strategies and indicated that except for the dam construction strategy that called for evaluating the possibility of a new impoundment in Harding County, these strategies are still relevant, though the updated list of strategies is much more focused on the project, program, and policy sponsors (Appendix 8-A). Actions that have been completed in order to implement the strategies identified in the 2007 regional water plan are summarized on Table 8-1.

8.2 Water Conservation

Municipal water use is generally low in the Northeast New Mexico Water Planning Region, and water conservation programs are already in place, many having been implemented as recommended in the 2007 accepted plan (Section 8.1). The Arch Hurley Conservancy District has significant water conservation projects planned, including lining the main canal between Conchas Reservoir and Tucumcari, but few other new system-specific municipal water conservation projects are included in this RWP update. However, water providers in the region will continue to implement their existing water conservation programs and drought contingency ordinances. As shown in Table 8-1, several water conservation and water reuse projects have been completed since the original plan was accepted in 2007.

There is significant interest in expanding water reuse in the region, for irrigation, potable use, industrial use, aquifer storage and recovery, and power generation using treated wastewater treatment plant effluent, cheese plant effluent, and produced water (from oil and gas or carbon dioxide wells). Treatment research is underway: the New Mexico State University (NMSU) Agricultural Science Center at Tucumcari plans to conduct water reuse research, including on how to safely use Class 1B effluent, and the NMED Drinking Water Bureau is funding a produced water study, which will determine the viability of produced water as a source for augmenting water supply sustainability in southeastern New Mexico and other areas with produced water resources. The Northeast New Mexico regional water planning group looks forward to the results of these research projects and to the expansion of water reuse projects as the water treatment costs come down in the future.

Other conservation projects that the group supports include the creation of critical conservation areas to protect the remaining saturated thickness of the Ogallala aquifer, the creation of agricultural land trusts to issue conservation easements, tax credits, and mitigation banking as means to conserve water and other resources related to land and water conservation, and research into the development of viable dryland crops.

Table 8-1. Implementation Status of Strategies Identified in Accepted Plan Northeast New Mexico Water Planning Region

Strategy	Status
Municipal conservation	Tucumcari, Clovis, and Portales are each implementing wastewater reuse projects.
	The City of Clovis added an addendum to their Water Conservation Plan in 2014.
	EPCOR Water (private water supplier for the City of Clovis) has a comprehensive municipal conservation program, which includes increasing block rates, public outreach, residential and non-residential rebates, and water conservation audit and retrofit kit giveaways. EPCOR Water also has a water leasing program, where they work with farmers to make more of the groundwater resources available for municipal use.
	The City of Portales developed an action plan for water conservation and drought management in 2010, Water Conservation and Use reports in 2013, 2014, and 2015, a Review of Water Supply Options report in 2013, and a Preliminary Engineering Report for Additional Water Supply in 2016.
	The Eastern New Mexico Water Utility Authority completed a Water Conservation Plan in 2014.
Agricultural conservation	Some operations have changed their irrigation methods, adopting more water conserving methods, and some have gone to dryland farming.
	Armor Ball AQUA project completed in Harding County, reducing evaporation off of stock tanks.
	In the Arch Hurley Conservancy District, some sections of canals have been replaced with pipeline or concrete ditches.
Groundwater management	Union County is implementing an aquifer mapping project and plans to expand it in the future to encompass a larger geographic area.
	The Eastern New Mexico Council of Governments completed a sampling program in 2015, which involved sampling over 70 wells in Curry and Roosevelt Counties. The results were reported in a New Mexico Bureau of Geology and Mineral Resources publication (February 2016).
	Curry County plans to begin an aquifer mapping project in 2016 (this study may also cover Roosevelt County).
Rangeland conservation and watershed management	To date, the Canadian River Riparian Restoration Project has mapped more than 880,000 riparian area acres, aerially treated over 30,000 acres of salt cedar, masticated more than 10,000 acres, used cut stump treatment on 78 acres, revegetated over 600 acres with native vegetation, and installed riparian fencing. A mesquite eradication program is also underway, and a large game enhancement project that will treat approximately 4,000 acres per year was started in 2016.

Table 8-1. Implementation Status of Strategies Identified in Accepted Plan Northeast New Mexico Water Planning Region

Strategy	Status
Rangeland conservation and watershed management (cont.)	Ute Reservoir Watershed Based Planning is underway, and the plan will include strategies for addressing water quality impairments within the reservoir's contributing watershed, including voluntary range management strategies.
Water rights protection	Methods identified by the 2007 regional water plan to protect water rights and prevent out-of-region transfers included efforts to influence water rights transactions, developing area-of-origin protections, adopting conservation easements, and transferring development rights. No known progress has been made on any of these initiatives since the previous plan was completed.
	In 2012, the City of Clovis purchased 1,200 acre-feet of water rights adjacent to Cannon Air Force Base in order to prolong the life of the Ogallala aquifer in this area.
Eastern New Mexico Rural Water System	The 30 percent design deliverable for the entire project was completed in 2009.
	The Eastern New Mexico Water Utility Authority (ENMWUA) was created by legislative action (HB15) effective July 1, 2010 and superseded the Eastern New Mexico Rural Water Authority (ENMRWA).
	An Environmental Assessment with a Finding of No Significant Impact (FONSI) was signed in January 2011.
	A drought management plan was completed in 2012, under contract with the U.S. Bureau of Reclamation.
	The Eastern New Mexico Rural Water System (ENMRWS) intake structure design was completed in 2014 and the first phase of construction on the intake structure was completed in 2016.
	The Interim Groundwater Project's three design packages began in 2012. The 60 percent design for the first package was completed in 2016. The 100 percent designs for the second and third packages were completed in 2016.
	Acquisition of easements for the second and third design packages of the Interim Groundwater Project began in 2016.
Infrastructure upgrades	The Village of Logan completed a wastewater and sewer expansion project in January 2010, which connected all homes, businesses, and State Parks facilities on the north side of Ute Lake to the system.
	A reuse system was installed that takes treated effluent from the City of Tucumcari to the NMSU Agricultural Science Center at Tucumcari for irrigation use. This project was funded by a Water Trust Board award.
	The NMSU Agricultural Science Center at Tucumcari completed water system and septic system upgrades in 2015 (they are now connected to the City of Tucumcari water and wastewater systems).

Table 8-1. Implementation Status of Strategies Identified in Accepted Plan Northeast New Mexico Water Planning Region

Strategy	Status
Planning for growth	Harding County completed a Comprehensive Plan and implemented a County MainStreet Program in 2013.
Planning for growth (cont.)	In 2014 the North East Economic Development Organization completed an Economic Development Plan for a 7-county area that includes Union, Harding, and Quay Counties.
	40-year plans were completed by Quay County (2011) and the City of Clovis (2012).
	Quay County completed a Ute Reservoir Yield Study in December 2015.
	As noted in the 2007 regional water plan, specific criteria that could be used to assess the long-term viability of water supplies are largely lacking, and it is difficult to quantitatively determine whether water will be available for a period of time. No widespread data collection or modeling development has occurred since the 2007 plan was completed.
	The growth that was projected as part of the 2007 regional water plan has not occurred, and the group would like to see this strategy be revised to instead plan for sustaining the current economy, rather than planning for significant growth.
Dam construction	No progress has been made toward planning a Canadian River diversion to supply a Harding County water supply project.

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

In addition to continuing with strategies from the previous plan, the Northeast New Mexico 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 Northeast New Mexico 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, eight meetings were held with stakeholders in the Northeast New Mexico region. These meetings identified the program objectives, presented draft supply and demand calculations for discussion and to guide strategy development, and provided an opportunity for stakeholders to provide input on the PPPs that they would like to see implemented (Section 2). A summary of the PPP information, obtained primarily from input supplied directly by stakeholders, is included in Appendix 8-A. Information was requested during several open meetings, and requests for input were also e-mailed to all stakeholders that had expressed interest in the regional water planning process.

Some water projects were identified through the State of New Mexico Infrastructure Capital Improvement Plan (ICIP), Water Trust Board, Capital Outlay, and NMED funding processes. Projects on the 2017-2021 ICIP list (http://nmdfa.state.nm.us/ICIP.aspx, accessed March 2016) whose sponsors requested that their projects be included were added to the PPP table (i.e., the complete ICIP list was not automatically added to the PPP table in this region). The ICIP list 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 and other water-related infrastructure projects, as well as data collection, water conservation and reuse, and research 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, data collection, and water planning.

In the Northeast New Mexico region, projects identified on the PPP table are primarily water system infrastructure and water conservation projects (groundwater sustainability is a major concern in Northeast New Mexico). Because municipal water use is generally low and water conservation programs are already in place, few system-specific municipal water conservation projects are included. However, water providers in the region will continue to implement their water conservation programs and drought contingency ordinances. As discussed in Section 8.2, the water conservation projects that are included on the PPP table call for creation of critical conservation areas to preserve the remaining Ogallala aquifer, creation of agricultural land trusts, agricultural conservation, research, water catchment projects, and water banking.

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 and determining the projects of greatest interest. Key collaborative projects identified by the steering committee and Northeast New Mexico region stakeholders are shown on Table 8-2 and include the ongoing Canadian River Riparian Restoration Project, which aims to restore the Canadian River watershed, as well as the ENMRWS and TQCRWA projects, which will treat and deliver surface water from Ute Reservoir. (Note that by motion on August 31, 2011, the NMISC took the position that the Eastern New Mexico Water Utility Authority [ENMWUA] intake structure will be the only intake structure at the reservoir [the NMISC previously approved the design of the proposed Quay County intake structure]).

Table 8-2. Key Collaborative Programs, Projects, and Policies
2016 Northeast New Mexico Regional Water Plan
Page 1 of 5

Project Description	Project Lead	Project Partners	Probable Funding Source(s)	Cost Range	Major Implementation Issues
Canadian River Riparian Restoration Project (CRRRP)					
Existing project with the goal of restoring the watershed to a healthy productive state that will provide native habitat for a variety of wildlife and improve water for communities, agriculture, and recreation.	Jack Chatfield, CRRRP	• Eight soil and water conservation districts in northeastern New Mexico • State and federal agencies • Landowners	• Natural Resources Conservation Service (NRCS) Environmental Quality Incentives and Regional Conservation Partnership Programs • New Mexico Water Trust Board (WTB) • Pittman-Robertson funds (administered by the New Mexico Department of Game & Fish) • New Mexico Environment Department (NMED) • U.S. Forest Service (USFS) • North America Wetlands Conservation Act • Wild Turkey Federation	Unlimited	Funding (this is an existing program that operates using the funds that are secured)

Table 8-2. Key Collaborative Programs, Projects, and Policies
2016 Northeast New Mexico Regional Water Plan
Page 2 of 5

Project Description	Project Lead	Project Partners	Probable Funding Source(s)	Cost Range	Major Implementation Issues
Regional aquifer mapping project					
Implement a regional aquifer mapping project, like the Union County project, to collect information to assess the groundwater resources on a regional scale.	• Northeastern Soil and Water Conservation District (SWCD) (working to expand the Union County project to include Harding, Colfax, and Mora Counties) • City of Clovis (Curry and Roosevelt Counties)	Union, Harding, Quay, Curry, Roosevelt, Colfax, and Mora Counties	Legislative appropriation (not funded to date)	The HB 254 (To Study and Map Northeast New Mexico Aquifers) 2015-2016 Legislative session request was for $1.725 million (M)	Funding
Tucumcari Quay County Regional Water Authority (TQCRWA) project					
Water supply project that will involve installing an intake structure and treatment plant on the south side of Ute Reservoir to provide surface water to Quay County, Tucumcari, and Logan for municipal and industrial use (these users collectively have been allocated up to 7,550 acre-feet per year of water from Ute Reservoir).	TQCRWA	• Quay County • City of Tucumcari • Village of Logan	Not identified	Not estimated	Funding

Table 8-2. Key Collaborative Programs, Projects, and Policies
2016 Northeast New Mexico Regional Water Plan
Page 3 of 5

Project Description	Project Lead	Project Partners	Probable Funding Source(s)	Cost Range	Major Implementation Issues
Eastern New Mexico Rural Water System (ENMRWS) Project					
Water supply project that will treat and deliver water from Ute Reservoir to Clovis (Cannon AFB will receive part of the Clovis allotment), Portales (Roosevelt County will receive part of the Portales allotment), Elida, Melrose, Texico, Grady, and Curry County. Eastern New Mexico Water Utility Authority (ENMWUA) members collectively have been allocated up to 16,450 acre-feet per year of water from Ute Reservoir.	ENMWUA	• Clovis • Cannon AFB • Portales • Elida • Melrose • Texico • Grady • Curry County • Roosevelt County • U.S. Bureau of Reclamation (USBR) • New Mexico WTB	• USBR • New Mexico WTB	Interim Groundwater Packages (Capital Cost): • FW-1: $44.7M • FW-2: $25M • FW-3: $30.1M The anticipated funding split on this project will be 75% federal, 15% state and 10% local	Funding
Llano Estacado water conservation initiative					
An initiative that would form a critical conservation area west of Clovis, in parts of Quay, Curry, and Roosevelt Counties, in order to preserve the Ogallala aquifer and promote recharge.	City of Clovis	• Curry County • Area farmers and landowners	• NRCS Regional Conservation Partnership Program • New Mexico WTB	$6.2M per year ($62M over 10 years)	Funding

Table 8-2. Key Collaborative Programs, Projects, and Policies
2016 Northeast New Mexico Regional Water Plan
Page 4 of 5

Project Description	Project Lead	Project Partners	Probable Funding Source(s)	Cost Range	Major Implementation Issues
Arch Hurley Conservancy District (AHCD) agricultural conservation projects					
Water conservation improvements including water metering, weed and brush control, lining and/or pipelining of on-farm ditches and main canals, laser-leveling of fields, irrigation scheduling, conjunctive management of surface water and groundwater, and implementation of more efficient irrigation water delivery systems.	AHCD	District members	• USBR WaterSMART grants • New Mexico WTB	For lining the main canal from Conchas Reservoir to Tucumcari, the cost will be $1M to $1.5M per mile (AHCD budgets $500,000 annually in their ICIP for this).	Time frame during the off season (water is in the canal except for 3.5 to 4 months per year), and the remote location (between Conchas Reservoir and Tucumcari).
Development of viable dryland crops					
New Mexico State University's (NMSU's) Agricultural Science Centers at Tucumcari and Clovis are conducting research on the development of viable dryland crops, and the work should be continued and expanded.	NMSU	• Neighboring states' Agricultural Experiment Stations and Cooperative Extension Services • U.S. Department of Agriculture (USDA)	• USDA (National Institute of Food and Agriculture/Agricultural and Food Research Initiative) • NRCS • New Mexico Specialty Crop Grants • New Mexico Legislative appropriations • New Mexico WTB • Capital Outlay	Dependent on the nature of the research, $10,000 to $100,000 per year, conservatively, not including faculty and support staff salaries and benefits.	• Ongoing drought impacts the ability to collect meaningful data • Suitable irrigation equipment and infrastructure must be in place • Success depends on producer acceptance and implementation

Table 8-2. Key Collaborative Programs, Projects, and Policies
2016 Northeast New Mexico Regional Water Plan

Project Description	Project Lead	Project Partners	Probable Funding Source(s)	Cost Range	Major Implementation Issues
Water reuse					
Water reuse projects using all sources of treated water (municipal wastewater, dairy and cheese plant wastewater, and produced water) for various uses, including irrigation, potable use, industrial use, aquifer storage and recovery, and power generation.	• City of Clovis • City of Portales • City of Tucumcari (all individual projects)	NMSU Agricultural Science Center at Tucumcari	New Mexico WTB	Varies by project, water source, necessary treatment, and water use	• Permitting • Funding
Creation of agricultural land trusts					
Creation of agricultural land trusts to issue conservation easements, tax credits, and mitigation banking as means to conserve water and other resources related to land and water conservation.	Not identified (regional or state-wide land trust would be set up as a 501(c)(3) nonprofit organization and would be overseen by a board of directors)	Not identified	• NRCS Regional Conservation Partnership Program • New Mexico WTB	Not estimated	Project funding and leadership
Playa lake restoration projects					
Implementation of playa lake best management practices (e.g., establishing grass buffers around playa lakes), in order to protect playa lakes from sedimentation and promote recharge.	Not identified	• NRCS • SWCDs • Landowners	NRCS	Unlimited	Project funding and leadership

Another key collaborative project that was identified, regional aquifer mapping, has widespread support in the region. These projects collect information to assess groundwater resources on a regional scale. The Northeastern SWCD and Zeigler Geologic Consulting, LLC began a Union County aquifer mapping project in 2007. The Union County project activities include annual measurement of winter static water levels, water quality sampling, age dating to determine groundwater residence time, geologic mapping and well log analyses, and revision of existing geologic maps. The preliminary conclusion from these data sets is that groundwater in Union County can locally be highly partitioned, with little modern recharge (the Dry Cimarron valley has a different groundwater resource regime with moderate recharge). A bill was introduced during the 2015-2016 Legislative session (HB 254, To Study and Map Northeast New Mexico Aquifers) that would have expanded this project to include Harding, Colfax, and Mora counties, but it was not funded. The bill will be reintroduced next year, potentially also including Quay County. The New Mexico Bureau of Geology & Mineral Resources plans to start a similar project covering Curry and Roosevelt counties in 2016. The Northeast New Mexico regional water planning group would like to see regional aquifer mapping projects completed for the whole state.

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, Northeast New Mexico region identified the following recommendations for PPPs to be considered in the state water plan:

- Support and seek funding for implementation of statewide data collection and aquifer mapping programs.
- Support drinking water system collaboration efforts and regionalization projects.
- Support policies that promote water reuse and efforts to advance treatment technologies (reducing costs).

- Provide resources for watershed-scale watershed management and playa lake conservation projects.
- Support the creation of an agricultural water conservation initiative, which would pay producers to reduce their irrigation demands by funding the implementation of agricultural water conservation substrategies (also assist with the identification of funding). Such a program could allow agricultural water to be banked or potentially leased for municipal use.
- Work with the other states to revisit the interstate compacts, in order to add drought provisions.
- Provide a discussion in the state water plan on forfeiture of water rights, reductions in water rights diversions within critical management areas, and the ability of farmers to expand their irrigated acreage to use water that is conserved, addressing what happens when (1) acreage is enrolled into conservation programs, (2) a town buys water from a farm but does not hook existing wells onto their systems right away, and (3) drought prevents water use.
- Revise the 40-year water planning provision to require longer-term water planning.
- Support State and local control and management of water resources, in response to attempts to federalize water management.
- Monitor the proposed expansion of the scope of the Clean Water Act and the potential impact to water management and supplies.
- Require well drillers to report water level data to the NMOSE. The Northeast New Mexico regional water planning group would also like to require pump service companies to provide water level data to the NMOSE; however, those companies are administered by the Construction Industry Division and not the NMOSE, so the NMOSE does not have authority to require that they report this information. The group feels these data are important and should be reported.
- Seek funding for ongoing regional water planning and regional water plan implementation.

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

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Appendix 2-A

Master Stakeholder List

Northeast New Mexico Region 1 RWP Master Stakeholder List

Updated June 15, 2016

Last	First	Affiliation / Category
Abrego	Debbie	Southwest Cheese, Environmental Dept.
Acheampong	Steve	Tucumcari Basin Manager, New Mexico Office of the State Engineer (NMOSE)
Archuleta	Nick	Commissioner, Harding County
Armstrong	Rachel	District Conservationist, U.S. Department of Agriculture, Natural Resources Conservation Service (USDA NRCS)
Ashley	Tim L.	Commissioner, Curry County
Atkinson	Mike	U.S. Forest Service, Kiowa/Rita Blanca National Grasslands District Ranger
Baca	Angelina	Baca Law Office
Bailet	Daniel	EPCOR
Baker	Wayne	New Mexico Farm & Livestock Bureau Peanut Board
Barajas	Mike	NMOSE, Curry County Basin Manager
Bedford	Larry	
Bennett	Brad	Realtor, Bennett Land Company
Bennett	Justin	Union County/ Northeastern Soil and Water Conservation District (SWCD)
Blackburn	Frank	Chairman, Curry County Commission
Boone	Pat	New Mexico Cattle Growers
Bordegaray	Angela	State Water Planner, New Mexico Interstate Stream Commission (NMISC)/NMOSE
Bostwick	Wendell	Commissioner, Curry County
Box	Philip	Arch Hurley Conservancy District & farmer President of the RAD Rural Water Coop in Quay County
Bradley	Walter	Executive Director, Dairy Farmers of America
Briscoe	Glenn	
Bruce	D'Llaynn	District Conservationist USDA NRCS
Bruhn	Johnna	NMDA Policy & Plan Analyst
Brumfield	Gayla	Chairperson Eastern New Mexico Water Utility Authority (ENMWUA) Former Mayor of Clovis
Bryant	Brad	Quay County Commissioner
Bryant	Chris	City Commissioner, City of Clovis
Burrill	Jennifer	New Mexico Justice Center
Burroughes	Claire H.	Assistant City Manager, City of Clovis
Buzard	Kendell	Roosevelt County Farm Bureau
Caldwell	Dr. Patrice	Director of Planning, Eastern New Mexico University (ENMU)

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.

Northeast New Mexico Region 1 RWP Master Stakeholder List

Updated June 15, 2016

Last	First	Affiliation / Category
Campbell	Mary Libby	Supervisor, Ute Creek SWCD Harding County MainStreet
Carter	Shelley	Union County
Carnes	Quentin	Roosevelt SWCD
Caruthers	Kent	President, Citizen's Bank
Cartron	Dominique	Daniel B. Stephens & Associates, Inc.
Casados	Robert	Harding County
Chancey	Sandy	Executive Director, Eastern Plains Council of Governments (COG)
Chandler	Caleb	Interstate Stream Commissioner Former State Senator & Former Curry County Commissioner Secretary, ENMWUA
Chatfield	Jack	Canadian River Riparian Restoration Project
Cherry	Mike	Quay County Commissioner
Chosvig	Jack	Town of Clayton Mayor
Cone	Mike	Roosevelt SWCD Chair
Crews	Tuda Libby	Harding County MainStreet Program Ute Creek Cattle Company
Crockett	Barbara	CH2M HILL
Crowder	Randy	City of Clovis Interstate Stream Commissioner
Culbertson	Joe	Harding County
Davis	Kenneth	Curry County Farm Bureau
DeHerrera	Rosie	Big Country Realty
Delarosa	Norma	Curry County
Dixon	Durward	Mayor of Elida
Dodge	George	State Representative
Dowell	Sue	Quay County Commissioner
Elliott	Gary	Commissioner, District 2, City of Clovis
Ewing	Amy	Daniel B. Stephens & Associates, Inc.
Farmer	Tim	NMOSE, District VII Manager
Fluhman	Larry	President, Farmer's and Stockmen's Bank
Foote	Tim	Deep water irrigator Cattle stocker operator
Fry	Larry	Clovis City Manager
Garza	Juan F.	City of Clovis, Mayor Pro Tem / Commissioner District 1
Gonzales	Angie	County Manager, Union County
Grisham	Patti	Director, Tucumcari Chamber of Commerce
Gully	Misty	Arch Hurley Conservancy District

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.

Northeast New Mexico Region 1 RWP Master Stakeholder List

Updated June 15, 2016

Last	First	Affiliation / Category
Harden	Clint	
Heckendorn	Harry	B&H Ranch
Hendricks	Jean	Director, Clovis Economic Development Corp.
Henson	U. V.	Arch Hurley Conservancy District Board
Holmes	Tommy	Border SWCD
Howalt	Justin	Executive Director, ENMWUA
Hubbert	Dr. Michael	NMSU Clayton Livestock Research Center
Huerta	Mark	EPCOR Water
Idsinga	Beverly	Dairy Producers of New Mexico
Johnson	Carolyn	City of Texico City Clerk
Kay-Fantozzi	Shelby	Public Affairs, Cannon Air Force Base (AFB)
King	Sharon	Vice Chair, ENMWUA Mayor of Portales
Kinman	Deena	Border SWCD
Kircher	Patrick	Roosevelt County Extension
Lane	Wade	Village of San Jon
Langenegger	Jared	Tucumcari City Manager
Lansford	David	Mayor, City of Clovis
Lansford	Matt	
Lauriault	Leonard	Superintendent of New Mexico State University's Agricultural Science Center at Tucumcari
Lightfoot	Clay	Mesa SWCD
Livengood	Stan	Executive Director, Roosevelt County Community Development Corp.
Lee	Cynthia	Village of San Jon
Lenderking	Jake	Water Resources Manager – Arizona & New Mexico, EPCOR Water
Lopez	Ernie	Cimarron District Forester
Lopez	Jake	Commissioner, Roosevelt County
Lovett	Leo	City of Clovis
Lucero	Ferron	Town Manager, Town of Clayton
Lumpkin	Robert	Mayor, Tucumcari
Lutes	Jennifer	Northeastern SWCD
Mackey	Corby	Vice-President, First National Bank of New Mexico
Mackey	Harold	Commissioner, Harding County
Madrid	Fidel	Commissioner, District 3, Clovis
Martin	Tom	Commissioner, District 4, Clovis
Martinez	Jonathan	NMISC

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.

Northeast New Mexico Region 1 RWP Master Stakeholder List

Updated June 15, 2016

Last	First	Affiliation / Category
Martinez	Stacie	Mesa SWCD
McCasland	Franklin	Arch Hurley Conservancy District
McDaniel	Ben	Vice Chair, Curry County Commissioner
McQuillan	Dennis M.	New Mexico Environment Department Liquid Waste Program
Menapace	Vanita	Harding Extension Office, Harding County
Merrick	Jack	Realtor, Buena Vista Realty
Mitchell	Debra	Arch Hurley Conservancy District board member
Mitchell	Terry	Harding County/ CO_2 extractive industry
Mondragon	Raymond	EPCOG
Morley	Andy	NMOSE, District II Manager
Mortin	Seth	
Nelson	Erik	New Mexico State Land Office Central Curry SWCD
Pachta	Patrick	Border SWCD
Palla	Wayne	Deep water irrigator Dairy farmer
Pattison	Hoyt	Curry County Farm Bureau
Pollen	Todd	Union County
Poster	Bruce	Demographics & Population Consultant
Powell	Danny	New Mexico Ground Water Association / BP Pump
Powell	Leona	Village of Grady Clerk/Treasurer
Prather	Blake	Curry County agricultural representative
Primrose	Richard	County Manager, Quay County
Privett	Dawn	Roosevelt SWCD
Pyle	Lance A.	County Manager, Curry County
Randals	Richard	Realtor, New Mexico Property Group
Redmond	Doug	City Manager, City of Portales
Reeves	Craig	President, CEO, First National Bank of New Mexico
Reid	Doug	Curry County agricultural representative; Reid Farms
Riley	Rosalie	County Clerk
Rivera	Jose	University of New Mexico
Romero	Rosemary	Rosemary Romero Consulting
Roybal	Kerri	NMISC
Rucker	Billy	Route 77 Dairy
Sandoval	Robert	County Commissioner for Curry and City of Clovis
Sawyer	Sandra Taylor	Commissioner, District 2, City of Clovis
Schoap	Ed	

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.

Northeast New Mexico Region 1 RWP Master Stakeholder List

Updated June 15, 2016

Last	First	Affiliation / Category
Shafer	Wesley	Mayor of Grady, New Mexico
Sidwell	Tom	Southwest Quay SWCD
Smart	Scott	VP for Business Affairs, ENMU
Smith	Becky	Harding Commissioner
Stafford	Nate	Camp Manager, El Porvenir Christian Camp
Stall	Rex	NMISC, Ute Reservoir
Steers	Chet	Newly elected County Commissioner
Strand	Vicki	Community Development Director, City of Tucumcari
Stoner	Toni	Village of San Jon
Summers	Kim	Town of Elida
Surgeon	Blanca	Rural Community Assistance Corporation
Vanderpool	Patrick	Executive Director, Tucumcari Economic Development
Van Wormer	Mark	Coordinator, Union County Community Development Corporation
Verhines	Scott	Occam EC Consulting Engineers, Inc.
Wallin	Larry	Village of Logan
Wilbanks	Jena	Interim County Manager, Roosevelt County
Wiley	Gary	Regional Vice-President, New Mexico Bank and Trust
Woods	Pat	New Mexico State Senator

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

Northeast Regional Water Plan Compilation of Comments on Draft Plan

NO.	Comment Source	Location (Section/ Page/ Paragraph)	COMMENTS
1	Richard Primrose	Section 4.7.1	The draft plan cites Roswell as the location for the nearest OSE water master. This should be checked (there is also a water master in Cimarron).
2	Cannon AFB (John Rebman)	Table 5-12	Cannon AFB requests that the following releases be removed from the table for the reason cited: a. 1402 Sewage Lift Station: The aboveground storage tank previously supported a sewage lift station (Building 1402) behind our clinic (Building 1400). The tank was not situated underground. As such, this release should not be included on Table 5-12. Although the release was referred to the New Mexico Environment Department (NMED) Ground Water Quality Bureau (as noted in the table's "Status" column), it was resolved many years ago. On October 24, 2000, I reported the release to NMED; mitigation actions were completed on October 26, 2000. The estimated five gallons released from an aboveground fuel storage tank, supplying fuel to the lift station's ancillary power generator, entered a drainage ditch. Heavy precipitation the previous day washed fuel within the drainage ditch to a nearby pond located on our golf course. The resultant sheen on the pond was physically removed, and remaining fuel in the ditch was allowed to naturally attenuate. b. Bldg/Fac 2110: The release was investigated under the Air Force Environmental Restoration Program (ERP). Following a Resource Conservation and Recovery Act Facility Investigation (RFI), the status of this site was deemed "Response Complete"; as such, no further remediation actions are required. c. Facility 728: The release was investigated under the ERP. Following the RFI, the status of this site was deemed "Response Complete"; as such, no further remediation actions are required. d. Bldg 600: The release was investigated under the ERP. Following the RFI, the status of this site is "Site Closure"; as such, no further remediation (or site restriction controls) actions are required. e. Bldg 368: The release was investigated under the ERP. Following the RFI, the status of this site was deemed "Response Complete"; as such, no further remediation actions are required. f. Bldg 2285: The release was investigated under the ERP. Following the RFI, the status of this site is "Response Complete"; as such, no further remediation actions are required.
3	Cannon AFB (John Rebman)	Table 6-4	This table identifies per capita water usage based on population served and the amount of water (surface or groundwater) withdrawn. The identified acre-feet of water withdrawn in 2010 (804 acre-feet) is accurate; however, the population reported (2,301) is too low. As a result, the per capita usage is grossly exaggerated. Because many of the people that work on Cannon AFB don't reside on base, it's difficult to accurately determine what the consumer population is. To help with this assessment, the following is offered: In 2010, Cannon AFB determined its population while defining requirements for upgrading its wastewater treatment plant (WWTP). For planning purposes, the population served by a WWTP is used to determine daily average and peak capacity requirements. The population was a combination of the following subsets: Active duty military: 3,405 DoD employees: 601 Contractors: 348 Military dependents: 4,414 All others (e.g., non-appropriated fund employees): 357 While the entire 9,125 population did not have access to water 24/7, a significant portion of this population consumed water at least part of the day. A sanitary survey conducted by the NMED Drinking Water Bureau identified a population of 4,200. While Cannon AFB believes even this population is low in terms of those that have access to water, it's significantly higher than that reported in Table 6-4. For that reason, Cannon AFB requests that a population of 4,200 be used when determining per capita usage.

Northeast Regional Water Plan Compilation of Comments on Draft Plan

NO.	Comment Source	Location (Section/ Page/ Paragraph)	COMMENTS
4	Tuda Libby Crews		See separate document entitled *Implementing Water Conservation Strategies*
5	Justin Howalt, ENMWUA Executive Director	Reference	Two new reference documents have been provided that were not referenced in the sections that the State prepared for the draft Northeast New Mexico regional water plan update. These include a study on the Water Sustainability and Management of Cannon Air Force Base (the Trinity report, dated February 2012), and a New Mexico Bureau of Geology and Mineral Resources publication titled "A Hydrogeologic Investigation of Curry and Roosevelt Counties, New Mexico" (OFR-580, February 2016). Both documents were provided by Justin Howalt, ENMWUA Executive Director on March 28, 2015, and have been given to the ISC.
6	Jake Lenderking, Water Resources Manager - NM & AZ, EPCOR Water	Section 5, Table 8-1, Section 8	Please include information about EPCOR Water's municipal water conservation and water leasing programs in the updated plan.

Appendix 6-A

List of Individuals Interviewed

Appendix 6-A. List of Individuals Interviewed
Northeast New Mexico Water Planning Region

Name	Title	Organization	City
Rosie DeHerrera	Realtor	Big Country Realty	Clayton
Craig Reeves	President, CEO	First National Bank of New Mexico	Clayton
Mark Van Wormer	Coordinator	Union County Community Development Corporation	Clayton
Ferron Lucero	City Manager	City of Clayton	Clayton
Angie Gonzalez	County Manager	Union County	Clayton
Larry Fluhman	President	Farmers and Stockmens Bank	Clayton
Vanitta Monapace	Assistant to Harding County Commission	Harding County	Mosquero
Rachel Armstrong	District Conservationist	USDA - NRCS	Tucumcari
Vicki Strand	Community Development Director	City of Tucumcari	Tucumcari
Richard Primrose	County Manager	Quay County	Tucumcari
Patrick Vanderpool	Executive Director	Tucumcari Economic Development Corp.	Tucumcari
Patsy Gresham	Executive Director	Tucumcari Chamber of Commerce	Tucumcari
Richard Randals	Realtor	New Mexico Property Group	Tucumcari
Corby Mackey	VP	First National Bank	Tucumcari
Sandy Chancey	Executive Director	Eastern Plains COG	Clovis
Brad Bennett	Realtor	Bennett Land Company	Clovis
Kent Caruthers	President	Citizens Bank	Clovis
Lance Pyle	County Administrator	Curry County	Clovis
Scotty Savage	District Conservationist	NRCS USDA	Clovis/Portales
Frank Blackburn	Commissioner	Curry County	Clovis
Pat Woods	Farmer	Curry County	Clovis
Jean Hendricks	Director	Clovis Economic Development Corp.	Clovis
Joe Thomas	City Manager	City of Clovis	Clovis
Robert Hagevoort	Extension Dairy Specialist and Associate Professor	NMSU Agricultural Science Center	Clovis
Shelby-Kay Fantozzi	Public Affairs	Cannon AFB	Cannon AFB
Charlene Webb	County Manager	Roosevelt County	Portales
Doug Redmond	City Manager	City of Portales	Portales
Sharon King	Mayor	City of Portales	Portales

Appendix 6-A. List of Individuals Interviewed
Northeast New Mexico Water Planning Region

Name	Title	Organization	City
Jake Lopez	Commissioner	Roosevelt County	Portales
Dr. Patrice Caldwell	Director of Planning	Eastern New Mexico University	Portales
Stan Livengood	Executive Director	Roosevelt County Community Development Corp.	Portales
Doug Powers	City Manager	City of Tucumcari	Tucumcari
Jack Merrick	Realtor	Buena Vista Realty	Portales
Gary Wiley	Regional VP	New Mexico Bank and Trust	Clovis/Portales

Appendix 6-B

Projected Population Growth Rates, 2010 to 2040

Appendix 6-B. BBER Projected Five-Year Population Growth Rates, 2010 to 2040 Northeast New Mexico Water Planning Region

County	Five-Year Growth Rate (%)					
	2010-2015	2015-2020	2020-2025	2025-2030	2030-2035	2035-2040
Union	5.58	5.48	4.95	4.42	3.96	3.53
Harding	-0.29	-1.30	-2.05	-3.43	-3.40	-2.88
Quay	-0.96	-0.70	-0.57	-0.41	-0.18	0.19
Curry	4.21	3.72	3.55	3.52	3.36	3.04
Roosevelt	8.07	7.02	5.80	4.89	4.33	4.01

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.

Appendix 8-A

Recommended Projects, Programs, and Policies

Regional Water Planning Update

Projects, Programs, and Policies

Water Planning Region 1: Northeast New Mexico

County	Regional or System Specific	Strategy Type (Project, Program or Policy)	Category	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
Multiple Counties													
Union, Harding, Quay, Colfax, Mora, San Miguel, and Guadalupe (entire Canadian River Watershed)	R	Project	Watershed restoration	Canadian River Riparian Restoration Project	NE Regional Water Plan Update Initial draft list of Projects, Programs, and Policies, June 17, 2015	The Canadian River Riparian Restoration Project's current efforts include removal of invasive native vegetation (e.g., mesquite), and non-native invasive species (e.g., salt cedar). Current efforts target salt cedar, piñon juniper, cholla, and mesquite. There is a new electrostatic method that may be used in the future.	Canadian River Riparian Restoration Project		Ongoing			Increase water efficiency and improve watershed health.	Funding will be sought from NMFA WTB 2015-2016, NMDGF 2015-2016, NMENV 2015-2016, USDA Forest Service 2015-2016, and RCPP 2015-2016
Colfax, Union, Harding, San Miguel, and Quay (Ute Reservoir contributing watershed)	R	Project	Water quality	Ute Reservoir Watershed Based Planning	NE Regional Water Plan Update Initial draft list of Projects, Programs, and Policies, June 17, 2015	Ute Reservoir Watershed Based Planning is underway, and the plan will include strategies for addressing water quality impairments within the reservoir's contributing watershed, including voluntary range management strategies.	Canadian River Riparian Restoration Project	New Mexico Environment Department	Ongoing to 2018		$60,000	Improve water quality in Ute Reservoir by implementing strategies throughout the contributing watershed.	
Curry, Roosevelt	R	Project	Water system infrastructure	Eastern New Mexico Rural Water System	NE Regional Water Plan Update Initial draft list of Projects, Programs, and Policies, June 17, 2015	The ENMRWS project will treat and deliver water from Ute Reservoir to Clovis (CAFB will receive part of the Clovis allotment), Portales, Elida, Melrose, Texico, Grady, and Curry County (Roosevelt County will receive part of the Portales allotment). ENMWUA members collectively reserve up to 16,450 acre-feet of water per year from Ute Reservoir. The project's current focus is on the interim pipeline.	Eastern New Mexico Water Utility Authority (ENMWUA)	Water Trust Board, Bureau of Reclamation	Ongoing	PER Completed - 2005 30% Design Completed - 2009 Value Engineering Completed - 2009 EA Completed - 2011	Interim Groundwater Packages (Capital Cost) FW-1: $44.7M FW-2: $25M FW-3: $30.1M	The Ogallala aquifer is declining at significant rates in eastern New Mexico. Areas have seen decreases from 0.5 foot to 5.8 feet each year. In the last 15 years the water provider for the City of Clovis has increased the number of wells by three times to keep up the same production capacity. The ENMRWS will supply its member communities with a sustainable source of water.	The funding for the project is based on 75% Federal, 15% State and 10% Local.
Curry, Roosevelt	R	Project	Data collection	Aquifer lifetime map of Curry and Roosevelt Counties	Email from Claire Burroughes, City of Clovis Legislative & Community Development Director, February 29, 2016	The New Mexico Bureau of Geology and Mineral Resources is preparing an aquifer lifetime map for Curry and Roosevelt Counties, to be completed in 2017.	City of Clovis	Curry County, City of Portales, Roosevelt County	2016-2017		$68,500	An aquifer lifetime map will be created in order to evaluate the remaining groundwater resources.	
Curry, Roosevelt (potential for expansion to Union, Harding, Quay, De Baca, and Guadalupe)	R	Program	Water quality	Source water protection plan	NE Regional Water Plan update meeting, June 22, 2015	The Eastern Plains Council of Governments (EPCOG) recently collected groundwater quality samples in Curry and Roosevelt Counties, in association with their source water protection plan. The report is dated February 2016, and was published in conjunction with the New Mexico Bureau of Geology and Mineral Resources. There is potential to expand the program to include the additional EPCOG counties in the future.	EPCOG	New Mexico Bureau of Geology and Mineral Resources				Monitor water levels, and monitor and protect water quality in Curry and Roosevelt Counties (potentially expanding the planning program to encompass all 7 EPCOG counties in the future).	
Quay, Curry, and Roosevelt	R	Program	Water conservation	Llano Estacado water conservation initiative (establishing a critical conservation area)	Llano Estacado water conservation initiative proposal (received from Blake Prather, 2/17/2015)	The Llano Estacado water conservation initiative proposal calls for the creation of a critical conservation area west of Clovis, in parts of Quay, Curry, and Roosevelt Counties. The area includes over 16,000 irrigated acres and over 100 playa lakes, and is the primary source of remaining groundwater in the Ogallala aquifer in New Mexico. The program objective is to preserve the Ogallala aquifer for future municipal, domestic, commercial, and Cannon Air Force Base use, while also promoting recharge by restoring playa lakes and the adjacent uplands. The program proposes to pay producers to stop irrigating, with average payments of $325 per acre and minimum contracts of 10 years. The proposal estimates that $6.2 million/year will be needed to fund the project, and funding has not been identified to date.	City of Clovis					Preserve the Ogallala aquifer, and conserve the City of Clovis and Cannon Air Force Base water supplies.	
Roosevelt, Chaves, Lea	R	Project	Water conservation	Cloud seeding	NE Regional Water Plan Update Initial draft list of Projects, Programs, and Policies, June 17, 2015	There is interest in implementing cloud seeding in Roosevelt, Chaves, and Lea Counties. Funding has been sought multiple times, including a bill that was introduced during the 2014-2015 legislative session that would have funded a cloud seeding project in Roosevelt and Lea Counties. Funding has not been secured to date.						Increase precipitation in Roosevelt, Chaves, and Lea Counties.	

Regional Water Planning Update

Projects, Programs, and Policies

Water Planning Region 1: Northeast New Mexico

County	Regional or System Specific	Strategy Type (Project, Program or Policy)	Category	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
Union, Harding, Quay, Curry, and Roosevelt	R	Policy	Water rights	Water rights protection	NE Regional Water Plan Update Initial draft list of Projects, Programs, and Policies, June 17, 2015	The Northeast RWP stakeholder group would like to see the water rights protection strategy from the 2007 plan expanded to include a discussion on forfeiture of water rights, reductions in water rights diversions within critical management areas, and the ability of farmers to expand their irrigated acreage to use water that is conserved. There was extensive discussion at the February 2015 meeting regarding beneficial use and what happens when (1) acreage is enrolled into conservation programs, (2) a town buys water from a farm but does not hook existing wells onto their systems right away, and (3) drought prevents water use. Because the regional water plan updates are so brief, this discussion may instead need to be included in the						Clearly communicate the implications of different strategies on water rights.	
Union, Harding, Quay, Curry, and Roosevelt	R	Policy	Water rights	State control of water resources management	NE Regional Water Plan Update Initial draft list of Projects, Programs, and Policies, June 17, 2015	Regarding the recent attempts to federalize water management, the updated regional water plan should stress that this region supports continued State control and management of water resources.						Protect water rights and their State and local control.	
Union, Harding, Quay, Curry, and Roosevelt	R	Program	Watershed restoration	Sustainable grazing practices	NE Regional Water Plan Update Initial draft list of Projects, Programs, and Policies, June 17, 2015	The updated Northeast RWP should address grazing land management, voluntary fencing, and education about sustainable grazing practices.						Sustainable grazing practices protect water quality and conserve land and playa lake resources.	
Union, Harding, Quay, Curry, and Roosevelt	R	Program	Water rights	Clean Water Act revision and implications	NE Regional Water Plan Update Initial draft list of Projects, Programs, and Policies, June 17, 2015	The Federal government has proposed to expand the scope of the Clean Water Act, and the Northeast RWP stakeholder group is concerned over the potential impacts to water management and supplies. The updated RWP should address the status of the potential changes.						The Northeast regional water planning group supports local control of water resources, and efforts to increase efficiency and utilization.	
Union, Harding, Quay, Curry, and Roosevelt	R	Program	Planning	Managed growth strategy	NE Regional Water Plan Update Initial draft list of Projects, Programs, and Policies, June 17, 2015	The growth that was projected as a part of the 2007 Northeast RWP has not occurred, and the existing planning for growth strategy should be revised to instead plan for sustaining the current economy, rather than planning for significant growth. There is support in the region for growth, while also considering the water demand for new developments and the affect the increased water use will have. The region wants to have a plan for how to supply water that allows for growth, and the stakeholder group encourages the development of 40-year water development plans by the municipalities in the region.						Planning for a sustainable water future.	
Union, Harding, Quay, Curry, and Roosevelt	R	Program	Water conservation	Conceptual water conservation initiative	NE Regional Water Plan update meeting, June 22, 2015	The potential for developing a conceptual water conservation initiative was discussed at the June 22, 2015 meeting. The program would operate like the Ogallala Initiative, using Federal funds to pay producers to reduce their irrigation demands (encouraging low water use crops) by funding the implementation of agricultural water conservation substrategies.						Preserve the Ogallala aquifer by reducing irrigation demands, conserving water supplies.	There was a comment that the region isn't likely to get a bailout from the Federal government to address the groundwater depletion.
Union, Harding, Quay, Curry, and Roosevelt	R	Project	Water conservation	Municipal water conservation	NE Regional Water Plan Update Initial draft list of Projects, Programs, and Policies, June 17, 2015	Update the municipal water conservation strategy from the 2007 regional water plan. Specific substrategies include preparing and implementing water conservation plans and ordinances, implementing rebate programs for water efficient appliances and landscaping, public education, rate structure revisions, leak detection programs, system water audits, and incentives for rainwater and graywater harvesting.	To be implemented on a system by system basis.					Implementation of municipal water conservation strategies on a system by system basis will conserve water resources, minimizing the costs of developing additional water resources and infrastructure, and may assist systems in obtaining project funding.	

Regional Water Planning Update

Projects, Programs, and Policies

Water Planning Region 1: Northeast New Mexico

County	Regional or System Specific	Strategy Type (Project, Program or Policy)	Category	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
Union, Harding, Quay, Curry, and Roosevelt	R	Project	Water conservation	Agricultural water conservation	NE Regional Water Plan Update Initial draft list of Projects, Programs, and Policies, June 17, 2015	Update the agricultural water conservation strategy from the 2007 regional water plan. Specific substrategies include changes in crop variety, changes in crop type, conversion to dryland farming, implementation of irrigation equipment efficiency improvements, irrigation scheduling, implementation of conservation tillage methods, well service and equipment maintenance, and on-farm flow metering. Agricultural terracing should also be included as an agricultural water conservation substrategy, with the goal of keeping water on farms. NMSU is Agricultural Science Centers at Tucumcari and Clovis are conducting research on some aspects of this currently, and the work should be continued and expanded. The potential for leasing agricultural water for municipal use should be included as a part of this strategy.	To be implemented on a producer by producer basis.					Groundwater is being depleted in much of the Northeast region. Implementation of this strategy would help to conserve the aquifers for future use.	
Union, Harding, Quay, Curry, and Roosevelt	R	Project	Water conservation	On-farm water conservation demonstration project	NE Regional Water Plan Update Initial draft list of Projects, Programs, and Policies, June 17, 2015	Implement an on-farm water conservation demonstration project similar to the Texas Alliance for Water Conservation project that is funded by the Texas Water Development Board. This program was started in 2004, and has a mission of conserving water by identifying agricultural production practices and technologies that will reduce the depletion of groundwater while maintaining or improving agricultural production and economic opportunities (see http://www.depts.ttu.edu/tawc/about.html). The TAWC field sites involve more than 6,000 acres in west Texas.	Not identified	Producers, industries, universities, and government agencies				Provides education and tools for producers to improve efficiencies in water use.	
Union, Harding, Quay, Curry, and Roosevelt	R	Project	Water conservation	Dryland farming research	NE Regional Water Plan Update Initial draft list of Projects, Programs, and Policies, June 17, 2015	Develop viable dryland crops. NMSU-Agricultural Science Centers at Tucumcari and Clovis are conducting research on this currently, and the work should be continued and expanded.						Identify crops that do not require irrigation, to promote water conservation without eliminating agriculture.	
Union, Harding, Quay, Curry, and Roosevelt	R	Project	Watershed restoration	Rangeland conservation and watershed management	NE Regional Water Plan Update Initial draft list of Projects, Programs, and Policies, June 17, 2015	The 2007 Northeast RWP discussed a variety of rangeland conservation and watershed management activities that can contribute to watershed health, including those that protect or improve water quality, enhance water supply, or enhance ecosystem health. The stakeholder group supports these ongoing efforts.						Implementation of watershed management activities can contribute to watershed health, including improving water quality, enhancing water supply and ecosystem health.	
Union, Harding, Quay, Curry, and Roosevelt	R	Project	Watershed restoration	Playa lake best management practices	NE Regional Water Plan Update Initial draft list of Projects, Programs, and Policies, June 17, 2015	The Northeast RWP stakeholder group supports the implementation of playa lake best management practices (e.g., establishing grass buffers around playa lakes), in order to protect playa lakes from sedimentation. Playa lakes serve as conduits for recharge to the underlying aquifers, provide water supply for livestock and wildlife, and habitat. Research has shown that grass buffers have the potential to capture soil and contaminants before they reach the playa lakes, preventing infill and promoting recharge. Management of the adjacent upland areas is also needed (e.g., grazing or haying the areas outside the buffers), so that water reaches the playa lakes.						Implementation of playa lake BMPs is needed to promote and protect recharge of the Ogallala aquifer.	
Union, Harding, Quay, Curry, and Roosevelt	R	Project	Watershed restoration	Rangeland and habitat improvement	NE Regional Water Plan Update Initial draft list of Projects, Programs, and Policies, June 17, 2015	The NRCS Environmental Quality Incentives Program (EQIP) sage-grouse initiative is funding rangeland improvements that improve sage-grouse habitat. This program involves coordinating with ranchers to address invasive species, conifer encroachment, and unsustainable grazing practices, as well as minimize land fragmentation. The goal of the program is to improve habitat, ultimately preventing the sage-grouse from being listed under the Endangered Species Act. Other species are also important, including the lesser prairie-chicken and other species that are being proposed for listing under the Endangered Species Act.						Habitat improvements may keep species from being listed under the Endangered Species Act (which would be beneficial). Species listings could have significant impacts to current land use.	

Regional Water Planning Update

Projects, Programs, and Policies

Water Planning Region 1: Northeast New Mexico

County	Regional or System Specific	Strategy Type (Project, Program or Policy)	Category	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
Union, Harding, Quay, Curry, and Roosevelt	R	Project	Water system infrastructure	Infrastructure upgrades	NE Regional Water Plan Update Initial draft list of Projects, Programs, and Policies, June 17, 2015	The 2007 plan summarized the funding that communities in the region received as part of the 2006 Severance Tax Bond Project Bill (House Bill 622), discussed other unfunded infrastructure needs, and noted the need for adequate staff and resources and the need for regional collaboration for emergency support and/or equipment sharing. The stakeholder group continues to support these efforts, and each community's individual infrastructure projects.						Infrastructure projects promote public health and safety, and ensure that the communities in the region remain vibrant.	
Union, Harding, Quay, Curry, and Roosevelt	R	Project	Water system infrastructure	Hydrant installation	NE Regional Water Plan update meeting, June 22, 2015	Install fire hydrants as a part of future infrastructure projects. The Village of Logan recently installed hydrants as a part of their sewer system expansion project, expanding fire flows, reducing Insurance Services Office (ISO) fire ratings (and lowering insurance premiums as a result).						Installing fire hydrants as a part of other infrastructure expansion/refurbishment projects allows for better fire protection and decreased insurance premiums.	
Union, Harding, Quay, Curry, and Roosevelt	R	Project	Water system infrastructure	Abandoned well management	NE Regional Water Plan Update Initial draft list of Projects, Programs, and Policies, June 17, 2015	The group supports proper well abandonment, in order to protect groundwater quality.						Proper well abandonment is necessary for the protection of public safety and water quality.	
Union, Harding, Quay, Curry, and Roosevelt	R	Project	Water conservation	Water banking	NE Regional Water Plan update meeting, June 22, 2015	The Northeast RWP stakeholder group wants to add water banking as a strategy in the updated plan. One potential water source is agricultural water; banked water would be for municipal use.						Water banking would allow for more flexibility in water resources management, potentially extending municipal water supplies.	
Union, Harding, Quay, Curry, and Roosevelt	R	Project	Water reuse	Water reuse	NE Regional Water Plan Update Initial draft list of Projects, Programs, and Policies, June 17, 2015	Reuse was not included as a strategy in the 2007 Northeast RWP, but should be added to the update. This includes reuse for irrigation, potable use, industrial use, aquifer storage and recovery, and power generation. Water sources should include treated wastewater treatment plant effluent, cheese plant effluent, and produced water (from oil and gas or CO_2 wells). The NMSU Agricultural Science Center at Tucumcari hopes to conduct water reuse research, including on how to safely use Class 1B effluent.						Water reuse is seen as a largely untapped water resource. Treated municipal wastewater is being used for irrigation in the region, but its use should be expanded, conserving groundwater resources for potable use. As treatment costs are reduced, reuse should expand to other water sources and uses, extending the remaining life of the aquifer.	At the June 22, 2015 meeting, there was a comment that using manure separators at dairies can cut water use by as much as 50 percent. This allows for water reuse, with the separated water being blended with fresh water.
Union County													
Union (potential expansion to Harding, Colfax, and Mora)	R	Project	Data collection	Geologic/aquifer mapping	NE Regional Water Plan Update Initial draft list of Projects, Programs, and Policies, June 17, 2015	There is a geologic/aquifer mapping project underway in Union County, and there is the potential to expand this work regionally. Funding was sought during the 2016 Legislative session that would have expanded this project to include Colfax, Harding, and Mora Counties, but funding was not secured. The stakeholder group would like to see this type of project implemented in all 5 counties within the planning region (and Statewide). The initial results of the study indicate a reduced areal extent of the Ogallala Aquifer in Union County compared to previous estimates, which may have implications for water planning.						Aquifer mapping projects are seen as a priority, with the Union County project serving as a model as these projects are expanded state-wide. The data collected provides a better understanding of the geology and water resources, and allows people to make better management decisions (on scales ranging from private landowners to County and State government).	
Union	SS	Project	Water system infrastructure	Town of Clayton Well 9 improvements	2017-2021 ICIP list and conversation with Justin Bennett at the NE RWP meeting on April 4, 2016		Town of Clayton				$250,000	Necessary infrastructure improvements for the Town of Clayton.	Funding not yet secured.
Union	SS	Project	Water system infrastructure	Town of Clayton water storage tank renovation	2017-2021 ICIP list and conversation with Justin Bennett at the NE RWP meeting on April 4, 2016		Town of Clayton				$1,050,000	Necessary infrastructure improvements for the Town of Clayton.	Funding not yet secured.
Harding County													

Regional Water Planning Update

Projects, Programs, and Policies

Water Planning Region 1: Northeast New Mexico

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Harding	SS	Project	Water system infrastructure	Mosquero water system improvements	2017-2021 ICIP list and conversation with Tuda Libby Crews and Mary Libby Campbell at the NE RWP meeting on April 4, 2016		Village of Mosquero				$870,000	Necessary infrastructure improvements for the Village of Mosquero.	Funding not yet secured.
Harding	SS	Project	Water system infrastructure	Roy water system improvements	2017-2021 ICIP list and conversation with Tuda Libby Crews and Mary Libby Campbell at the NE RWP meeting on April 4, 2016		Village of Roy				$1,111,000	Necessary infrastructure improvements for the Village of Roy.	Partial funding has been secured (need $586,000 in additional funds).
Harding	SS	Project	Water system infrastructure	Roy water storage tank improvements	2017-2021 ICIP list and conversation with Tuda Libby Crews and Mary Libby Campbell at the NE RWP meeting on April 4, 2016		Village of Roy				$400,000	Necessary infrastructure improvements for the Village of Roy.	Partial funding has been secured (need $360,000 in additional funds).
Harding	SS	Project	Water conservation	Mosquero equestrian center water catchment	Conversation with Tuda Libby Crews and Mary Libby Campbell at the NE RWP meeting on April 4, 2016	A rainwater harvesting project is being planned that will collect rainwater from the Mosquero equestrian center's arena roof.	Ute Creek and Mesa SWCDs; Mosquero Schools; and CRRRP		2016-2017			This project will promote water conservation, with the capture and use of rainwater for some uses at the Village of Mosquero equestrian center in the place of potable supply.	
Quay County													
Quay	SS	Project	Water conservation	Arch Hurley Conservancy District improvements	NE Regional Water Plan Update Initial draft list of Projects, Programs, and Policies, June 17, 2015	Water conservation improvements that the Arch Hurley Conservancy District (AHCD) is planning to implement include water metering, weed and brush control, concrete lining and/or pipelining of on-farm ditches and main canals, laser-leveling of fields, irrigation scheduling, conjunctive management of surface water and groundwater, implementation of more efficient irrigation water delivery systems (e.g., drip irrigation, sprinklers), and sodium bentonite or other comparable canal lining.	Arch Hurley Conservancy District					The ongoing AHCD water conservation improvements promote efficient use of the surface water resources, and ensure long-term viability of the District.	
Quay	R	Project	Water reuse	Tucumcari-NMSU water reuse project	NE Regional Water Plan Update Initial draft list of Projects, Programs, and Policies, June 17, 2015	NMSU Agricultural Science Center at Tucumcari effluent reuse project (this is a Water Trust Board funded project that takes treated water from the Tucumcari WWTP to the Agricultural Science Center for irrigation).	NMSU	Tucumcari, Water Trust Board	Reuse of treated municipal wastewater for agricultural irrigation began in 2012, and will continue indefinitely.		Initially, $1.75 million in Water Trust Board funds were provided to the City of Tucumcari to develop and install the system. Now, $250,000 per year in recurring funds are needed for salaries and operations, along with $2 million for replacement or upgrades of aging	This project is supporting research on the environmental and crop impacts of using treated municipal wastewater for agricultural irrigation, including for human food production. The findings may lead to future revisions to the current U.S. Environmental Protection Agency, U.S. Department of Agriculture, and New Mexico Environment Department policies regarding the use of treated municipal wastewater for human food production.	The Advisory Committee to the NMSU Agricultural Science Center at Tucumcari has prepared a program enhancement initiative for presentation to the State Legislature, which includes funding for a faculty researcher as well as facility replacement. This initiative is also supported by the Greater Tucumcari Economic Development Corporation and the Tucumcari Feed Efficiency Test, LLC.
Quay	SS	Project	Water reuse	City of Tucumcari water reuse	NE Regional Water Plan Update Initial draft list of Projects, Programs, and Policies, June 17, 2015	The City of Tucumcari is working to upgrade their wastewater treatment plant so that all treated wastewater will be reused for irrigation.	City of Tucumcari	NMSU Agricultural Science Center at Tucumcari	FY2017-2019, depending on funding		$5 million	This water reuse project will maximize the volume of treated wastewater that is reused, allowing the City to use less potable water for non-potable uses.	The City of Tucumcari is applying for USDA planning grant funding to complete the PER, and the preliminary engineering estimate for the project is $5 million.
Quay	SS	Project	Water system infrastructure	Center Street tank replacement	Recommended future strategies checklist, completed by Jared Langenegger (City manager)	The City of Tucumcari plans to replace their failed 1 million gallon Center Street water tank.	City of Tucumcari		FY2016-2017, depending on funding		$1.2 million	Necessary infrastructure improvements for the City of Tucumcari.	

Regional Water Planning Update

Projects, Programs, and Policies

Water Planning Region 1: Northeast New Mexico

County	Regional or System Specific	Strategy Type (Project, Program or Policy)	Category	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
Quay	SS	Project	Water system infrastructure	Aber Addition Infrastructure Improvements ICIP#13973	Letter from Jared Langenegger, Tucumcari City Manager, dated 5/2/2016.	Construct improvements for the Aber Addition to include: design and construction of approximately 1,520 L.F. of 10-inch water main, 2,400 L.F. 6-inch water main, yard lines, fire hydrants and water valves tied into the existing water system.	City of Tucumcari					Necessary infrastructure improvements for the City of Tucumcari.	
Quay	SS	Project	Water system infrastructure	East Route 66 Infrastructure Improvements ICIP#16105	Letter from Jared Langenegger, Tucumcari City Manager, dated 5/2/2016.	Design & construct approximately 3,375 L.F. of sewer pressure main paralleling Rt. 66 on the east side of the City. This project will be phased starting near KOA and completing 1,000 L.F. from the lift station and replacing old 6-inch steel line to the next manhole including 2 bores beneath U.S. Bureau of Reclamation canals and NMDOT ROW. Includes tie-ins and permits. Phase two and three will replace pressure main from the East Rt. 66 lift station and proceed west to McGee Street including 2 bores for a U.S. Bureau of Reclamation canal and possibly US 54.	City of Tucumcari					Necessary infrastructure improvements for the City of Tucumcari.	
Quay	SS	Project	Water system infrastructure	CDBG Water Streets Sewer ICIP#29837	Letter from Jared Langenegger, Tucumcari City Manager, dated 5/2/2016.	Repair various streets, water, sewer systems in the City.	City of Tucumcari					Necessary infrastructure improvements for the City of Tucumcari.	
Quay	SS	Project	Water system infrastructure	66 Lift Station Force main ICIP#24121	Letter from Jared Langenegger, Tucumcari City Manager, dated 5/2/2016.	Design and construct/repair/replace existing sewage line with reinforced materials, and conduct an environmental study of the project.	City of Tucumcari					Necessary infrastructure improvements for the City of Tucumcari.	
Quay	SS	Project	Water system infrastructure	KOA Lift Station ICIP#24120	Letter from Jared Langenegger, Tucumcari City Manager, dated 5/2/2016.	Updating an existing lift stations to continue the service it provides for the City.	City of Tucumcari					Necessary infrastructure improvements for the City of Tucumcari.	
Quay	SS	Project	Water system infrastructure	Water Tank Rehab/ Replacement ICIP# 15245	Letter from Jared Langenegger, Tucumcari City Manager, dated 5/2/2016.	Rehabilitate water tanks in Tucumcari to secure and upgrade the City's infrastructure. The City would like to rehab one water tank per year over the next five years, replacing the water tanks at risk of failure.	City of Tucumcari					Necessary infrastructure improvements for the City of Tucumcari.	
Quay	SS	Project	Water system infrastructure	Reuse Water Project Waste Water ICIP#29831	Letter from Jared Langenegger, Tucumcari City Manager, dated 5/2/2016.	Purchase land, and design, construct, and line ponds for storage of reuse water for irrigation.	City of Tucumcari					This water reuse project will maximize the volume of treated wastewater that is reused, allowing the City to use less potable water for non-potable uses.	
Quay	SS	Project	Water system infrastructure	Water System Inspection Camera ICIP#24127	Letter from Jared Langenegger, Tucumcari City Manager, dated 5/2/2016.	This inspection camera will be used to help the City find problem areas, so that repairs and replacements can be made before problems arise.	City of Tucumcari					Necessary infrastructure improvements for the City of Tucumcari.	
Quay	SS	Project	Water system infrastructure	Water Well Replacement ICIP#17379	Letter from Jared Langenegger, Tucumcari City Manager, dated 5/2/2016.	Upgrade wells and systems, including drilling replacement wells in areas where water levels are declining.	City of Tucumcari					Necessary infrastructure improvements for the City of Tucumcari.	
Quay	SS	Project	Water system infrastructure	Ute Lake Water pipeline ICIP#15396	Letter from Jared Langenegger, Tucumcari City Manager, dated 5/2/2016.	Design and construct a pipeline from Ute Lake to Tucumcari, in order to continue to supply water to our citizens. This will be 28 miles of 16-inch PVC pipeline from the Ute Lake water intake to Tucumcari, and will require easements along Hwy 54 from NMDOT and Union Pacific Railroad. We will plan, design and get easements the first year, and will put in approximately 7 miles of pipeline per year for the next 4 years.	City of Tucumcari					This pipeline project is necessary in order for the City to supply water from Ute Lake Reservoir to its customers.	
Quay	SS	Project	Water system infrastructure	Repair/Upgrade Water System ICIP#15351	Letter from Jared Langenegger, Tucumcari City Manager, dated 5/2/2016.	Repair and upgrade old waterlines in Tucumcari.	City of Tucumcari					Necessary infrastructure improvements for the City of Tucumcari.	
Quay	SS	Project	Water system infrastructure	Repair/Upgrade Sewer System ICIP#15350	Letter from Jared Langenegger, Tucumcari City Manager, dated 5/2/2016.	Repair and upgrade various sewer lines. The City would like to work on different sections of the sewer lines depending on the most needed over the next 5 years.	City of Tucumcari					Necessary infrastructure improvements for the City of Tucumcari.	

Regional Water Planning Update

Projects, Programs, and Policies

Water Planning Region 1: Northeast New Mexico

County	Regional or System Specific	Strategy Type (Project, Program or Policy)	Category	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
Quay	SS	Project	Water system infrastructure	Sewer Manhole Rehabilitation ICIP# 15352	Letter from Jared Langenegger, Tucumcari City Manager, dated 5/2/2016	Repair and replace old sewer manholes in Tucumcari.	City of Tucumcari					Necessary infrastructure improvements for the City of Tucumcari.	
Quay	SS	Project	Water system infrastructure	Water Equipment & Vehicles ICIP#24128	Letter from Jared Langenegger, Tucumcari City Manager, dated 5/2/2016	Replace old equipment with upgraded new equipment for the Water & Wastewater Departments.	City of Tucumcari					Necessary infrastructure improvements for the City of Tucumcari.	
Quay	SS	Project	Water system infrastructure	Wastewater Equipment & Vehicles ICIP#15295	Letter from Jared Langenegger, Tucumcari City Manager, dated 5/2/2016	Purchase new backhoe and vehicles over a 5 year period.	City of Tucumcari					Necessary infrastructure improvements for the City of Tucumcari.	
Quay	SS	Project	Water system infrastructure	Wastewater/ Water Communication System ICIP#19809	Letter from Jared Langenegger, Tucumcari City Manager, dated 5/2/2016	Purchase communication equipment for emergency purposes and well monitoring.	City of Tucumcari					Necessary infrastructure improvements for the City of Tucumcari.	
Quay	SS	Project	Water system infrastructure	Storm/Surface Water Control ICIP#15273	Letter from Jared Langenegger, Tucumcari City Manager, dated 5/2/2016	Control water flow for the City of Tucumcari in Quay County.	City of Tucumcari					This project will allow for better storm water management by the City of Tucumcari.	
Quay	SS	Project	Water system infrastructure	Drainage Plan ICIP#11557	Letter from Jared Langenegger, Tucumcari City Manager, dated 5/2/2016	Plan and construct drainage for the City of Tucumcari in Quay County.	City of Tucumcari					This project will allow for better stormwater management by the City of Tucumcari.	
Quay	SS	Project	Water system infrastructure	Upgrade various lift stations ICIP#29747	Letter from Jared Langenegger, Tucumcari City Manager, dated 5/2/2016	Purchase electrical parts and pumps to upgrade various lift stations in or around the City of Tucumcari.	City of Tucumcari					Necessary infrastructure improvements for the City of Tucumcari.	
Quay	SS	Project	Water system infrastructure	Lab Equipment ICIP#26288	Letter from Jared Langenegger, Tucumcari City Manager, dated 5/2/2016	Furnish and equip the City of Tucumcari Lab in Quay County.	City of Tucumcari					Necessary infrastructure improvements for the City of Tucumcari.	
Quay	SS	Project	Water system infrastructure	Lift Station Improvements ICIP#24122	Letter from Jared Langenegger, Tucumcari City Manager, dated 5/2/2016	Repair and replace existing lift station with new upgraded materials.	City of Tucumcari					Necessary infrastructure improvements for the City of Tucumcari.	
Quay	SS	Project	Water system infrastructure	Mountain Road Waterline Extension	Letter from Jared Langenegger, Tucumcari City Manager, dated 5/2/2016	Replacement of 6-inch waterline on Mountain Road with 10-inch line, and loop line across to Rock Island main to provide water sufficient water flow for business development along US Hwy 54/Mountain Road.	City of Tucumcari					Necessary infrastructure improvements for the City of Tucumcari.	
Quay	SS	Project	Water system infrastructure	Mountain Road wastewater upgrades	Letter from Jared Langenegger, Tucumcari City Manager, dated 5/2/2016	Upgrade wastewater lines and lift stations to service expanded uses along US Hwy 54. This will include upgrade of the Date street lift station, and possible replacement and upgrade of lines.	City of Tucumcari					Necessary infrastructure improvements for the City of Tucumcari.	
Quay	SS	Project	Water system infrastructure	Wastewater reuse	Letter from Jared Langenegger, Tucumcari City Manager, dated 5/2/2016	Investigate and possibly construct wastewater plant upgrades to allow for various levels of water reuse, to include at a minimum municipal landscaping irrigation possibly up to potable reuse.	City of Tucumcari					Necessary infrastructure improvements for the City of Tucumcari.	
Quay	SS	Project	Water system infrastructure	Desalination	Letter from Jared Langenegger, Tucumcari City Manager, dated 5/2/2016	Investigate and possibly construct a water desalination project to allow for the potable use of brackish water from surrounding aquifers.	City of Tucumcari					This water desalination project will investigate the possibility of the City of Tucumcari using a brackish water source as one source of water supply.	
Quay	SS	Project	Water system infrastructure	Fire hydrant replacement	Letter from Jared Langenegger, Tucumcari City Manager, dated 5/2/2016	Replace aging fire hydrants throughout the City to provide for adequate fire protection.	City of Tucumcari					Necessary infrastructure improvements for the City of Tucumcari.	

Regional Water Planning Update

Projects, Programs, and Policies

Water Planning Region 1: Northeast New Mexico

County	Regional or System Specific	Strategy Type (Project, Program or Policy)	Category	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
Quay	SS	Project	Water system infrastructure	Water meter replacement	Letter from Jared Langenegger, Tucumcari City Manager, dated 5/2/2016	Continue to replace water meters with radio read meters, ensuring 100 percent coverage within the water system.	City of Tucumcari					Necessary infrastructure improvements for the City of Tucumcari.	
Quay	SS	Project	Water system infrastructure	Upgrade lab	Letter from Jared Langenegger, Tucumcari City Manager, dated 5/2/2016	Ensure that the Tucumcari Lab continues to provide the high quality, reliable monitoring for water and wastewater systems. Possible purchase of new equipment and additional personnel.	City of Tucumcari					Necessary infrastructure improvements for the City of Tucumcari.	
Quay	SS	Project	Water system infrastructure	Well interconnection piping	Letter from Jared Langenegger, Tucumcari City Manager, dated 5/2/2016	The piping connecting the wells to the water system is in need of replacement and upgrades at all well fields, in order to ensure sufficient water supply for the City water system.	City of Tucumcari					Necessary infrastructure improvements for the City of Tucumcari.	
Quay	SS	Project	Water system infrastructure	Replacement of Hoover transmission line	Letter from Jared Langenegger, Tucumcari City Manager, dated 5/2/2016	The transmission line from the Hoover well field is in need of replacement, due to the age. This will be replacement of approximately 5 miles of 12-inch line from the well field to the City.	City of Tucumcari					Necessary infrastructure improvements for the City of Tucumcari.	
Quay	R	Project	Water system infrastructure	Tucumcari Quay County Regional Water Authority (TQCRWA) Project	NE Regional Water Plan Update Initial draft list of Projects, Programs, and Policies, June 17, 2015	Quay County, Tucumcari, and Logan collectively reserve up to 7,550 acre-feet of water per year from Ute Reservoir. The TQCRWA wants to install an intake structure and treatment plant on the south side of Ute Reservoir to provide surface water to these users for municipal and industrial use. The TQCRWA is also evaluating the potential for interconnection of water systems between Logan, San Jon, Tucumcari, and other rural water associations, in order to ensure that there is a sustainable water source for all communities in Quay County. Water hauling is currently occurring in portions of Quay County, and a regional system could potentially address this.	Tucumcari Quay County Regional Water Authority (TQCRWA)	Quay County City of Tucumcari Village of Logan				The TQCRWA project will allow for use of the Quay County reservations of water from Ute Reservoir. In addition, the regionalization projects will allow for more comprehensive and efficient water distribution, ensuring water supply for all residents in Quay County.	
Quay	R	Project	Water system infrastructure	Water system regionalization	Larry Wallin via email, April 15, 2015	The Village of Logan is undertaking regionalization efforts between the Villages of Logan and San Jon, Twelve Shore, and the Subdivisions of South Shore 1 & 2. They plan to continue to serve regional water to 12 Shores and San Jon, and are talking to Liberty Mutual Water about the possibility of supplying them. Logan and Tucumcari are also looking at looping their systems, providing a regional water provider. The Village of Logan is also looking to work with other water systems in Quay County on water quality issues, emergency planning, and maximizing operations and maintenance resources.	The Village of Logan	The Village of San Jon, City of Tucumcari, Quay County subdivisions				These regionalization efforts will help to ensure water supply for all residents in Quay County.	
Quay	SS	Project	Water system infrastructure	Village of Logan water system improvements	Larry Wallin via email, March 9, 2016	The Village of Logan has a variety of water system infrastructure upgrades planned, including adding a new water storage tank, rehabilitating the current water tanks, water transmission and distribution improvements, wellfield improvements (replacing aging wells), upgrading water meters to radio read, meter replacements, adding a new bridge water line attachment, and setting up a meter testing and calibration program for all meters in Logan, San Jon, and the Twelve Shores subdivision.	The Village of Logan					Necessary infrastructure improvements for the Village of Logan.	
Quay	SS	Project	Water conservation	Village of Logan water conservation plan	Larry Wallin via email, March 9, 2016	The Village of Logan plans to update their system's water conservation plan.	The Village of Logan					This water conservation plan update will provide an assessment of the Village's current water conservation program and be used to define the program's future goals, objectives, and methods, promoting ongoing efficient use of water resources.	
Quay	R	Project	Water rights	Village of Logan water rights purchase	Larry Wallin via email, March 9, 2016	The Village of Logan plans to purchase water rights in the future, to provide for the future growth of the Logan, Quay County, and San Jon water systems.	The Village of Logan	Quay County and Village of San Jon				This water rights purchase will ensure that the Village of Logan has adequate water rights to provide for future growth in Quay County.	
Quay	SS	Project	Watershed restoration	Ute Reservoir watershed improvements	Larry Wallin via email, March 9, 2016	The Village of Logan would like to undertake a watershed restoration project to improve the Canadian River watershed upstream of Ute Lake.	The Village of Logan					This proposed project will increase water efficiency and improve watershed health.	

Regional Water Planning Update

Projects, Programs, and Policies

Water Planning Region 1: Northeast New Mexico

County	Regional or System Specific	Strategy Type (Project, Program or Policy)	Category	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
Quay	SS	Project	Planning	Ute Reservoir sharing agreement	NE Regional Water Plan Update Initial draft list of Projects, Programs, and Policies, June 17, 2015	Quay County is interested in exploring the possibility of entering into Ute Reservoir shortage sharing agreements. The TQCRWA supports approval of a Minimum Pool of 3,765 feet at Ute Reservoir.	Quay County, Village of Logan, TQCRWA					Setting a new (higher elevation) minimum pool for Ute Reservoir would help to protect the regional economic benefits that result from the recreational and associated uses of Ute Reservoir, by lessening future water surface elevation fluctuations.	
Quay	R	Project	Water system infrastructure	Rural Area Development Water Users Co-op Regionalization Project	Phillip Box, in an email dated July 8, 2015	RAD Water Users plans to implement and explore options for the regionalization, expansion, and new water sources for their existing water system. The system currently serves approximately 300 members, and may add 150-200 new members as a result of this project. The plans include planning, engineering, and construction for line and system expansion within the existing system for new and upgraded lines and connections. The project would include extending existing water lines to the northeast to serve 12 Shores on the south side of Ute Lake, as well as adding additional lines within the current service area. The RAD board is also looking into possible regionalization with communities in our area to provide water to underserved customers and fire suppression to outlaying areas. The RAD Water Users hope to explore possible new source wells for supply demands and backup resources. The hope is to accomplish these endeavors with funding from, USDA Rural Development, NMED Drinking Water Fund, NMFA Water Trust Board and other funding sources that are	RAD Water Users	Quay County, City of Tucumcari, Village of Logan				This regionalization project will help to ensure water supplies for all Quay County residents.	
Quay	R	Program	Watershed restoration	Rangeland/ riparian restoration research program	Regional water plan update checklist, completed by Leonard Lauriault, NMSU Agricultural Science Center at Tucumcari	The NMSU Agricultural Science Center at Tucumcari would like to establish a research and extension program for rangeland/riparian restoration by hiring appropriate faculty and support staff, and acquiring operating funds.	NMSU Agricultural Science Center at Tucumcari				$250,000 per year in recurring funds are needed for salaries and operations, along with $2 million for replacement or upgrades of aging infrastructure.	Mismanagement, invasive weeds/brush, drought, and other factors have led to a deterioration of watersheds (rangeland and riparian areas) that have impacted ranch profitability, wildlife services, precipitation infiltration/runoff and storage, soil erosion, air and surface water quality, and quality of life throughout northeastern New Mexico. Research and Extension programs are needed in the region to assist and build	
Quay	SS	Project	Data collection	Geologic/aquifer mapping	Conversation with Tom Sidwell at the Northeast RWP meeting on May 16, 2016	The Southwest Quay SWCD is talking to Kate Zeigler about having her conduct a geologic/aquifer mapping project for the district (the study may also include a few ranches that are located outside of the Southwest Quay SWCD's boundaries).						Aquifer mapping projects are seen as a priority in the region. The data that will be collected will provide a better understanding of the geology and water resources, and allow for more informed management decisions.	
Curry County													
Curry	SS	Project	Water reuse	Clovis water reuse project	NE Regional Water Plan Update Initial draft list of Projects, Programs, and Policies, June 17, 2015	The City of Clovis is using treated effluent for irrigation of turf areas, landfill dust control, and street sweeping. The project is being built in phases; the first phase (1A) in complete, and the second phase (1B) was funded by a Water Trust Board grant in 2014. Phase 1B will extend the project as far as Hillcrest Park and Yucca Middle School and increase the project's total annual demand to 234.3 million gallons.	City of Clovis		Ongoing			This water reuse project will maximize the volume of treated wastewater that is reused, conserving groundwater by allowing the City to use less potable water for non-potable uses.	
Curry	SS	Project	Water system infrastructure	EPCOR Water system hookup	NE Regional Water Plan Update Initial draft list of Projects, Programs, and Policies, June 17, 2015	Curry County is currently working with EPCOR Water to hook residents of South Clovis onto the EPCOR Water system, replacing domestic well supplies that are going dry.	Curry County	EPCOR Water				Provide a municipal water supply for residences where domestic water wells are going dry.	Curry County is currently seeking funding for this project.
Curry	SS	Project	Planning	Village of Grady 40-year water plan	2017-2021 ICIP list and conversation with Wesley Shafer, Mayor of Grady.		Village of Grady				$50,000	Grady plans to prepare a 40-year water plan to evaluate the current water supply and projected water demand, and to ensure that sufficient water supply is available to serve the current and projected water demands.	Funding not yet secured.

Regional Water Planning Update

Projects, Programs, and Policies

Water Planning Region 1: Northeast New Mexico

County	Regional or System Specific	Strategy Type (Project, Program or Policy)	Category	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
Curry	SS	Project	Water system infrastructure	Village of Grady water system improvements/ additions	2017-2021 ICIP list and conversation with Wesley Shafer, Mayor of Grady.		Village of Grady				$200,000	Necessary infrastructure improvements for the Village of Grady.	Funding not yet secured.
Curry	SS	Project	Water system infrastructure	Texico water system upgrades	2017-2021 ICIP list and conversation with Carolyn Johnson, Texico City Clerk, on April 21, 2016.	Project design is complete. Texico has funding from the New Mexico Water Trust Board for project construction, and the work has gone out to bid. This project has been included in case a second project phase is necessary in the future (in the event the construction is not completed using the project funds).	Texico		Ongoing (estimate that construction will be completed by Spring 2017)		Over $400,000 (WTB funding totals $389,000, and the rest is local match)	Necessary infrastructure improvements for Texico.	
Curry	SS	Project	Water system infrastructure	Texico new water storage tank	2017-2021 ICIP list and conversation with Carolyn Johnson, Texico City Clerk, on April 21, 2016.	Texico may add a new water tank on the south side of town, but the project timing and cost are not yet known.	Texico		Not known		Not known	Necessary infrastructure improvements for Texico.	
Curry	SS	Project	Wastewater system infrastructure	Texico lagoon system upgrades	2017-2021 ICIP list and conversation with Carolyn Johnson, Texico City Clerk, on April 21, 2016.	Texico is currently working on Phase 2 of their wastewater lagoon system upgrades. The project is being paid for by CDBG funding, and involves cleaning out and lining their second lagoon that was previously unlined, and adding 1-2 monitoring wells. The project will also include a Phase 3, although its timing and scope have not yet been determined.	Texico		Ongoing			Necessary infrastructure improvements for Texico.	
Curry	SS	Program	Water conservation	EPCOR Water (City of Clovis) conservation program	Jake Lenderking, EPCOR Water, in an email dated June 13, 2016.	EPCOR Water has a successful and comprehensive municipal conservation program, which includes increasing block rates, public outreach, residential and non-residential rebates, and water conservation audit and retrofit kit giveaways. This program will be continued into the future.	EPCOR Water (private water supplier for the City of Clovis)		Ongoing			The Ogallala aquifer is declining at significant rates in eastern New Mexico. This program will help to conserve the remaining groundwater resources, making them available for future municipal water supply.	
Curry	SS	Program	Water conservation	EPCOR Water (City of Clovis) water leasing program	Jake Lenderking, EPCOR Water, in an email dated June 13, 2016.	EPCOR Water has a water leasing program, where they work with farmers to shift water use from agricultural to municipal use. Under the leasing program, well owners are responsible for the wells meeting potable water supply standards, and EPCOR Water runs the necessary transmission lines to connect the wells to the system. EPCOR Water operates the leased wells and buys wet water from the owners. This program will be expanded in the future.	EPCOR Water (private water supplier for the City of Clovis)	Private well owners	Ongoing			The Ogallala aquifer is declining at significant rates in eastern New Mexico. This program will help to conserve the remaining groundwater resources, making them available for future municipal water supply.	
Roosevelt County													
Roosevelt	SS	Project	Water reuse	City of Portales water reuse project	NE Regional Water Plan Update Initial draft list of Projects, Programs, and Policies, June 17, 2015	The City of Portales is using NMED Clean Water State Revolving Loan Fund funding to implement a water reuse project. The reuse system will supply 3,000 gallons per minute of water, for use at sites such as the WWTP, parks, cemetery, industrial park, schools, and ENMU, as well as construction water and fire hydrants.	City of Portales					This water reuse project will maximize the volume of treated wastewater that is reused, conserving groundwater by allowing the City to use less potable water for non-potable uses.	
Roosevelt	SS	Project	Water system infrastructure and water reuse	City of Portales aquifer storage and recovery using treated effluent, installation of new wells, and water conservation	Draft City of Portales Preliminary Engineering Report for Additional Water Supply, dated September 11, 2015	The recommended project will combine Option 2 of Alternative 2 (ASR through direct injection wells at the Blackwater Well Field) with Alternative 3, rehabilitation and drilling new wells at the Blackwater Well Field and Alternative 4, water conservation. Implementation is recommended in three phases. Phase 1, to be completed in the next five years, would include test hole drilling, well rehabilitation, well drilling, and a feasibility study for aquifer storage and recovery. Phase 2, to be completed within 10 years, would include drilling additional wells, constructing an advanced water treatment facility, and completing the first direct injection well. Phase 3, to be completed in the next 20 years, would include constructing additional wells on property to be acquired outside of the existing well field. All phases of the Recommended Alternative would include water conservation to continually lower the per capita demand through a variety of strategies.	City of Portales		20 years		Total estimated costs: Phase 1 ($12.8 million) Phase 2 ($28.1 million) Phase 3 ($20.3 million)	Additional water supply alternatives are needed prior to/in addition to the ENMRWS project.	
Roosevelt	SS	Project	Water system infrastructure	Village of Elida Water Transmission Line Improvements	2017-2021 ICIP list and included per Kim Summers, Village of Elida Town Clerk (4/13/2016)		Village of Elida				$443,000	Necessary infrastructure improvements for the Village of Elida.	Funding not yet secured.

Regional Water Planning Update

Projects, Programs, and Policies

Water Planning Region 1: Northeast New Mexico

County	Regional or System Specific	Strategy Type (Project, Program or Policy)	Category	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
Roosevelt	SS	Project	Water system infrastructure	Village of Elida Water Transmission Line Replacements	2017-2021 ICIP list and included per Kim Summers, Village of Elida Town Clerk (4/13/2016)		Village of Elida				$1,385,000	Necessary infrastructure improvements for the Village of Elida.	Funding not yet secured.
Roosevelt	SS	Project	Water system infrastructure	Village of Elida Arsenic Treatment Plant	2017-2021 ICIP list and included per Kim Summers, Village of Elida Town Clerk (4/13/2016)		Village of Elida				$290,000	Necessary infrastructure improvements for the Village of Elida.	Funding not yet secured.
Roosevelt	SS	Project	Water conservation	Elida Fire Department Catchment System	Emails from Deena Kinman, Border SWCD, April 3 and 22, 2016.	A catchment system will be installed for the roof of the Elida fire department's #2 Station building, once construction is complete (the station is being built in 2016, and the catchment system will be installed in 2017). Border SWCD also plans to help other rural fire departments to get funding for catchment systems.	Border SWCD	Roosevelt County				This project will promote water conservation, with the capture and use of rainwater for some uses at rural fire departments in the place of potable supply.	Border SWCD will apply for a grant to pay for this project next year.
Roosevelt	SS	Project	Water system infrastructure and water conservation	Rural water storage for fire fighting	Emails from Deena Kinman, Border SWCD, April 3 and 22, 2016.	This project will involve installing water storage tanks on outlying ranches for fire fighting purposes. This will allow the fire department to use the stored water, rather than driving the long distance back into town to refill their trucks, speeding up the fire fighting process and conserving the scarce water supplies in the towns. The landowners will be allowed to use the water to water livestock, but will be required to keep the tank filled to a specified level to provide water for fire fighting.	Border SWCD	Roosevelt County				This project will increase water supply for fire fighting, while also providing supply for livestock watering in rural areas of the county.	
Statewide													
Statewide	R	Program	Planning	Develop water and energy conservation progress award program	Tuda Libby Crews, Harding County; NE Regional Water Plan Update Initial draft list of Projects, Programs, and Policies, June 17, 2015	The Northeast region recommends that a program similar to the Kansas Water and Energy Progress Award program that seeks innovative ideas for conserving water and energy be initiated in New Mexico.						There was a comment at one of the Northeast regional water planning meetings that New Mexico should develop an incentive program like Kansas has, and that this type of program would drive further water and energy conservation efforts.	
Statewide	R	Program	Planning	Develop a Water as a Crop program	Tuda Libby Crews, Harding County	There was a recommendation that New Mexico develop a program similar to the "Water as a Crop" program that has been developed by the Sand County Foundation (see http://waterasacrop.org/). That program has current projects in Texas and South Dakota, and offers land owners resources to improve water conservation, implementing land practices that prepare soil to absorb water when it rains. The NRCS has become a partner through their EQIP program.						There was a recommendation that New Mexico develop a program similar to the "Water as a Crop" program, to encourage water and land conservation practices.	
Statewide	R	Program	Planning	Collaborative water planning	NE Regional Water Plan Update Initial draft list of Projects, Programs, and Policies, June 17, 2015	Engage in conversation with Texas about conservation of the shared groundwater resources, to address concern over new groundwater development near the State line.						The Northeast regional water planning area borders Texas, and the group participants would like State officials to engage with Texas in a conversation about conservation of the shared Ogallala aquifer.	
Statewide	R	Program	Data collection	Groundwater management	NE Regional Water Plan Update Initial draft list of Projects, Programs, and Policies, June 17, 2015	The 2007 Northeast RWP examined various groundwater management and reporting activities that would assist the region in better monitoring groundwater levels and water quality. As a part of the current planning effort, the Northeast RWP stakeholders have discussed the negative impact of the decline in funding for these types of programs (e.g., USGS and NRCS monitoring programs), and would like to see data collected on a routine basis.						The Northeast regional water planning group would like to see more data collection efforts in the region. Aside from the ongoing efforts of agencies such as the USGS, the favored method is through aquifer mapping projects modeled after the Union County project. The group would like to see these projects implemented statewide. Having more and better data will allow for better management decisions to be made in the future.	
Statewide	SS	Project	Water conservation	Armor Ball AQUA	NE Regional Water Plan Update Initial draft list of Projects, Programs, and Policies, June 17, 2015	The Armor Ball AQUA product was recently developed to reduce evaporation off of stock tanks. The work was funded by Sandia National Laboratories and put into use on a Harding County ranch. The balls are put on the surface of open storage tanks, reduce evaporation by over 90 percent, and keep the water from freezing. This strategy could be expanded to other ranches, promoting conservation.						This project conserves water by reducing evaporation off of stock tanks. Implementation has been limited to one ranch so far, but could be much more widespread.	

Regional Water Planning Update

Projects, Programs, and Policies

Water Planning Region 1: Northeast New Mexico

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Statewide	SS	Project	Water conservation	Reuse of produced water	NE Regional Water Plan Update Initial draft list of Projects, Programs, and Policies, June 17, 2015	There is the potential to reuse produced water (from oil and gas and CO_2 wells). The treatment costs are high, but research is ongoing. Costs are expected to come down, allowing for widespread future implementation of this strategy.						This water reuse project could provide an alternative water source, allowing communities to use less potable water for non-potable uses.	
Multi-State													
New Mexico, Texas, Colorado, Kansas, and Nebraska	R	Program	Water conservation	Ogallala Initiative	NE Regional Water Plan Update Initial draft list of Projects, Programs, and Policies, June 17, 2015	The USDA Ogallala initiative is a program that pays producers not to irrigate. $6.5 million is being spent over a three year period to help conserve water and improve water quality in the Ogallala aquifer region. Priority areas for the 2015 fiscal year include the Northern High Plains groundwater basin in Colorado, priority areas in Kansas, and priority areas in eastern New Mexico. See http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/programs/initiatives/?cid=stelprdb1048809.	U.S. Department of Agriculture, Natural Resources Conservation Service		FY2015-2018		$6.5 million	This conservation project has the potential to extend the period where the Ogallala aquifer may continue to be used as a source of water supply by paying producers to stop irrigating.	At the 6/22/2015 Northeast RWP stakeholder meeting, the group agreed that three years is too short of a timeframe, and that not enough money is being invested for this program to be successful. The group estimates that $6.5 million will only take 10 circles out of production for 3 years, which will have limited impact. Due to equipment and other costs, the group said that these types of programs should have a minimum term of 5 years. Only producers with weak water are expected to participate in