San Juan Basin Regional Water Plan

September 2016

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

Cover photograph: Animas River, City of Farmington, river walk

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Note: Appendix designations indicate corresponding section in plan

List of Acronyms

°F	degrees Fahrenheit
ac-ft/yr	acre-feet per year
ALP	Animas-La Plata Project
AMO	Atlantic multidecadal oscillation
APP	Animas Power Plant
APSCo	Arizona Public Service Company
AWRM	Active Water Resource Management
BBER	Bureau of Business and Economic Research
BVPP	Bluff View Power Plant
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cfs	cubic feet per second
CID	Carlsbad Irrigation District
CRSP	Colorado River Storage Project
CWA	Clean Water Act
DWS	Domestic Well Statute
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
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
IHS	Indian Health Service
in/yr	inches per year
IPCC	Intergovernmental Panel on Climate Change
LPCD	La Plata Conservancy District
LQ	location quotient
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
MDWCA	mutual domestic water consumers association
MSA	Metropolitan Statistical Area

NAPI	Navajo Agricultural Products Industry
NASS	National Agricultural Statistics Service
NCDC	National Climatic Data Center
NGWSP	Navajo-Gallup Water Supply Project
NIIP	Navajo Indian Irrigation Project
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NMISC	New Mexico Interstate Stream Commission
NMOSE	New Mexico Office of the State Engineer
NMSA	New Mexico Statutes Annotated
NMSU	New Mexico State University
NMWQCC	New Mexico Water Quality Control Commission
NNMP	Navajo Nation Municipal Pipeline
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRCS	Natural Resources Conservation Service
NTUA	Navajo Tribal Utility Authority
NWNMCOG	Northwest New Mexico Council of Governments
NWS	National Weather Service
PDO	Pacific decadal oscillation
PDSI	Palmer Drought Severity Index
PNM	Public Service Company of New Mexico
PPP	project, program, and policy
PVACD	Pecos Valley Artesian Conservancy District
ROD	Record of Decision
RWP	regional water plan
SDWA	Safe Drinking Water Act
SJBWMP	San Juan Basin Watershed Management Plan
SJCP	San Juan-Chama Project
SJGS	San Juan Generating Station
SJRBRIP	San Juan River Basin Recovery Implementation Program
SJSWCD	San Juan Soil and Water Conservation District
SJWC	San Juan Water Commission
SJWG	San Juan Watershed Group
SNOTEL	snowpack telemetry
SWCD	soil and water conservation district

TDS	total dissolved solids
TMDL	total maximum daily load
UCRC	Upper Colorado River Commission
USBR	U.S. Bureau of Reclamation
USDA	U.S. Department of Agriculture
U.S. EPA	U.S. Environmental Protection Agency
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)
WUA	water users association

Executive Summary

The San Juan Basin Water Planning Region, which includes San Juan County and parts of McKinley, Sandoval, and Rio Arriba 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 San Juan Basin Regional Water Plan was completed and accepted by the NMISC in 2003.

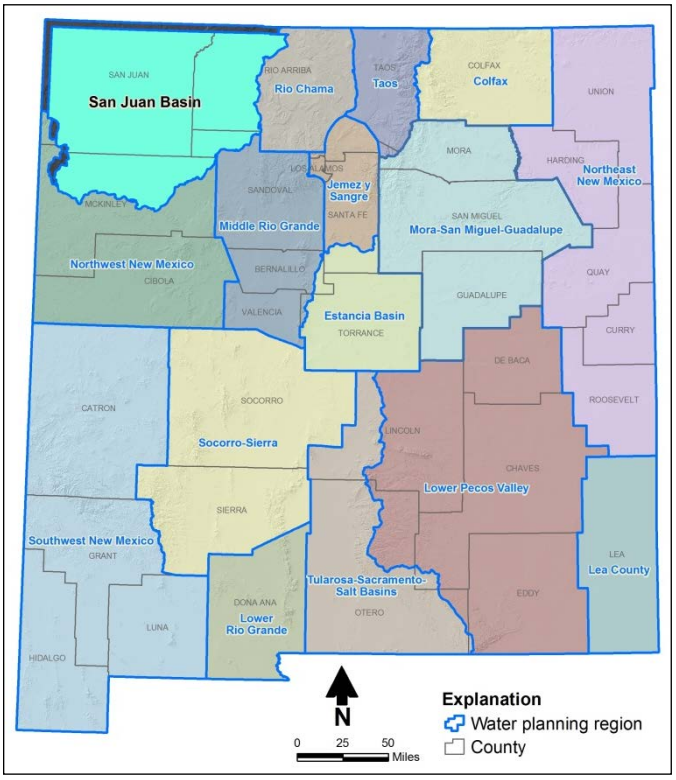


Figure ES-1. San Juan Basin Water Planning Region

The purpose of this document is to provide new and changed information related to water planning in the San Juan Basin region and to evaluate projections of future water supply and demand for the region. Accordingly, this regional water plan (RWP) update summarizes key information in the 2003 plan and provides updated information regarding changed conditions and additional data that have become available.

Based on 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 multi-year, drought-adjusted available water supply, which is estimated at about 730,000 acre-feet. Strategies that the region identified to address water resources management issues include watershed management, stream restoration, water quality protection, irrigation conveyance efficiencies, water banking, and land use. Water system infrastructure upgrade and improvements are also important within the region.

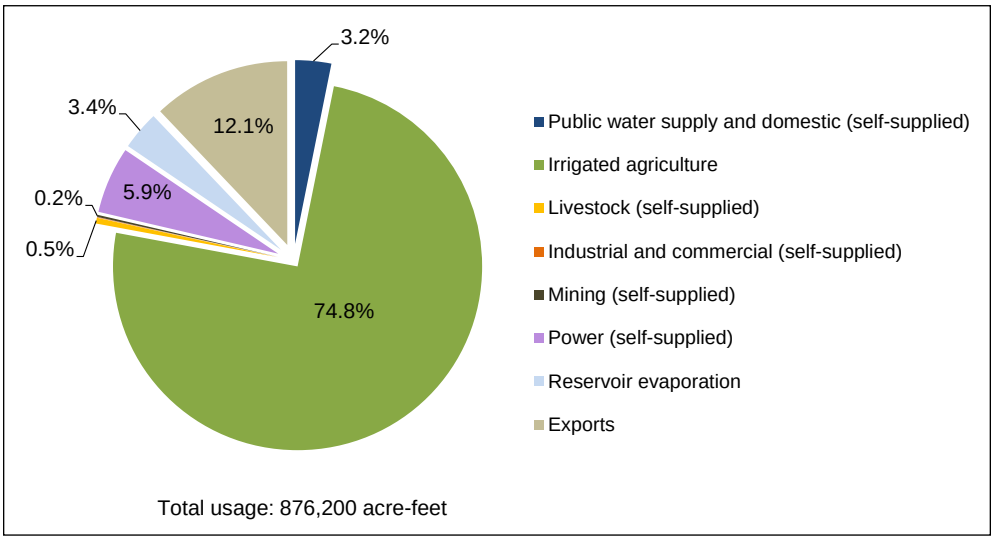


Figure ES-2. Total Regional Water Demand, 2010

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

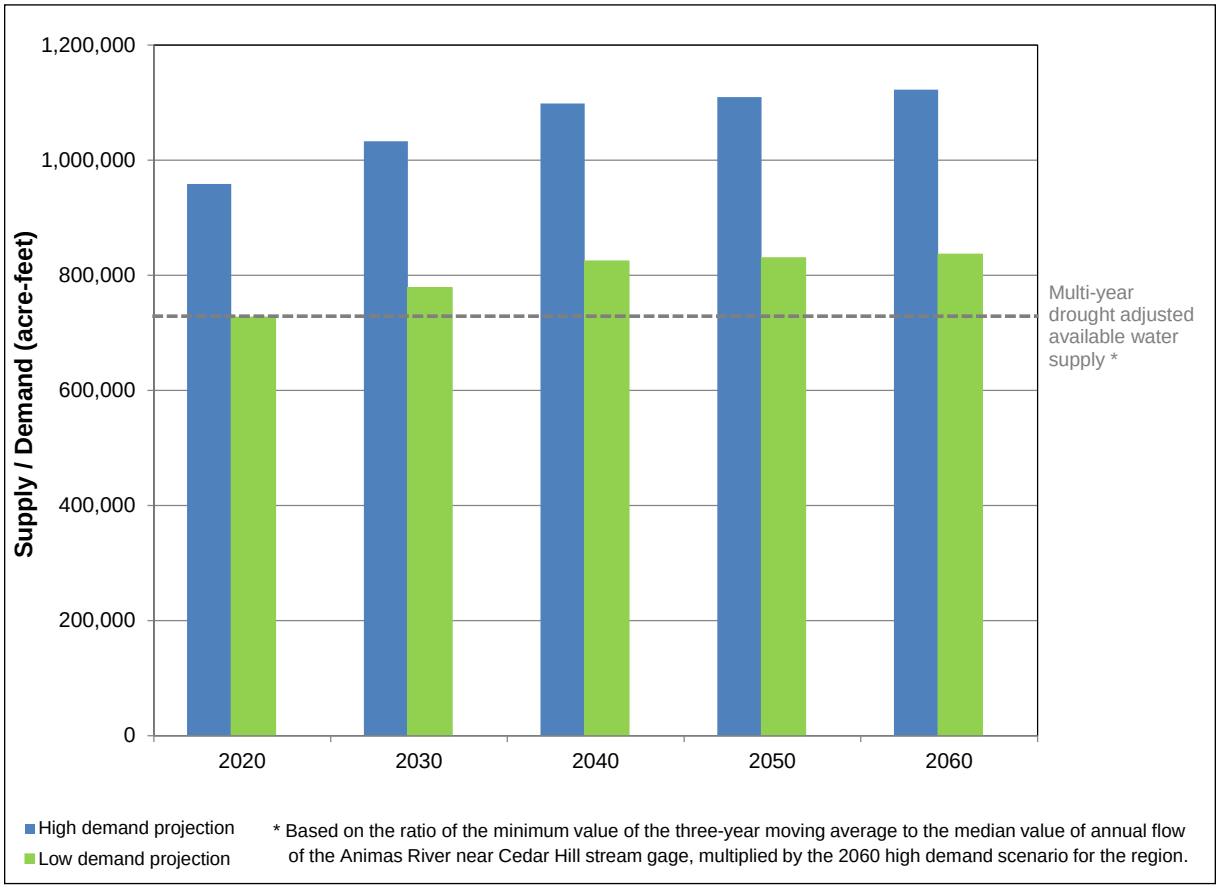


Figure ES-3. Available Supply and Projected Demand

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

Planning Method

The *Updated Regional Water Planning Handbook: Guidelines to Preparing Updates to New Mexico Regional Water Plans* (Handbook) describes a technical approach (referred to in the Handbook as a common technical *platform*) for analyzing the water supply in each water planning region, but recognizes that other methods can be used to account for supply and demand. The 2016 RWPs for other water planning regions in New Mexico present an analysis of the administrative water supply for the region using the technical approach described in the Handbook, which is intended to represent supply considering both physical and legal limitations based on estimates of recent diversion amounts. However, the plan for the San Juan Basin Water Planning Region does not incorporate the technical approach described in the Handbook because that approach does not adequately take into account the following:

- The substantial reservoir storage capacity that was developed to allow the water in the San Juan River Basin to be used
- Authorized full development of federal water supply projects
- Actual diversion practices and reservoir operations on the San Juan and Animas rivers
- The water apportionments made to New Mexico by the Colorado River and Upper Colorado River Basin compacts

Because of these circumstances, the long-term amount of water from the San Juan River stream system that is available for use in New Mexico in normal (non-drought) years far exceeds the estimates of administrative water supply and severe drought-adjusted administrative water supply that would be calculated using the technical approach described in the Handbook. Under the terms of the 1922 Colorado River Compact and the 1948 Upper Colorado River Basin Compact, New Mexico was apportioned an estimated 642,380 acre-feet per year of consumptive use for water development within the state. The amount of water diverted may substantially exceed the amount of water consumptively used, and return flows from uses of water diverted from the San Juan or Animas rivers generally are available for diversion to meet water demands for downstream uses.

The method for estimating future demand in the San Juan Basin region was therefore is based on:

- Historical and current diversion demands in the region through 2014
    - The 2006 State of New Mexico Schedule of Anticipated Upper Basin Depletions
    - Full development of authorized water uses, including the Animas-La Plata Project, the Navajo-Gallup Water Supply Project, litigation settlement allocations for non-project uses, and Indian reserved water rights

- Population growth projections for the region
- Additional information currently available relating to future uses

The method for estimating supply during future droughts needed to be modified for this region. The multi-year drought-adjusted available water supply is based on the ratio of the minimum value of the three-year moving average to the median value of annual flow of the Animas River near Cedar Hill stream gage, multiplied by the 2060 high demand scenario for the region.

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 San Juan Basin 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 San Juan Basin region include the following:

- In 2006 the Bureau of Reclamation (USBR) completed a Final Environmental Impact Statement and Record of Decision (ROD) on operations of Navajo Reservoir on the San Juan River, which together provide for either operating the reservoir to meet Navajo Reservoir water supply contract deliveries and the San Juan River Basin Recovery Implementation Program's (SJRBRIP's) flow recommendations for the San Juan River below Farmington, or providing a suitable alternative to the flow recommendations depending upon hydrologic conditions. Operating the reservoir in accordance with the

ROD and the SJRBRIP's flow recommendations helps to provide Endangered Species Act (ESA) compliance for federal water development and water management activities in the San Juan River basin.

- Surface water supplies the majority of water uses in the San Juan Basin region, making the region vulnerable to shortages during times of extreme or extended drought when reservoir storage might be exhausted. The major water users from the San Juan River in New Mexico have developed recommendations for annual river operations and administration within New Mexico that include maximum diversion rates or amounts for each of the major water users or associated uses and provisions for sharing water supply shortages; the latest agreement on such recommendations covers the period 2013 through 2016, and negotiations for a new agreement covering the period 2017 through 2020 are nearly complete. There is no similar shortage sharing agreement on the Animas River, which is a challenge for operations and water users during times of drought. On the La Plata River, diversions are administered by priority, and by July of each year, streamflow is typically insufficient to meet diversion demands. Similarly, there are insufficient streamflows in the Chaco River drainage and insufficient reservoir storage to adequately irrigate historical Navajo Reservation farmlands in and near the Chuska Mountains or elsewhere in the drainage.

- The 2009 Northwestern New Mexico Rural Water Projects Act approved the San Juan River Basin in New Mexico Navajo Nation Water Rights Settlement Agreement (San Juan Navajo Water Rights Settlement) and authorized construction of the Navajo-Gallup Water Supply Project (NGWSP) to service municipal and domestic water demands of the Navajo Nation, the Jicarilla Apache Nation, and the City of Gallup. The Act also authorizes funding for rehabilitation of the Hogback and Fruitland irrigation projects on Navajo Reservation lands in the San Juan River valley. A final San Juan Navajo Water Rights Settlement conforming to the provisions of the Act and a related Navajo Reservoir water supply contract for the Navajo Nation were executed in December 2010. In November 2013 the Court in the San Juan River Adjudication entered two significant rulings that defined the rights of the Navajo Nation in New Mexico to divert and use water from the San Juan River, including Navajo Reservoir, from the Animas River and groundwater, and from ephemeral tributaries to the San Juan River, including in the Chaco River drainage.

- The Northwestern New Mexico Rural Water Projects Act also authorized funding of up to $11 million to be appropriated through federal fiscal year 2019 for the repair, rehabilitation, or reconstruction of non-Navajo irrigation diversion and ditch facilities in the San Juan River basin in New Mexico to improve water use efficiency. The application of federal funding for such improvements to irrigation canal distribution systems and on-farm irrigation practices is subject to 50 percent non-federal cost-sharing.

- The USBR completed the Animas-La Plata Project (ALP) as authorized by the Colorado Ute Settlement Act Amendments of 2000, which will provide water supplies for municipal, industrial, and domestic uses in Colorado and New Mexico. Lake Nighthorse, the pumped-storage facility for the ALP, was completed and filled in June 2011 with a total storage capacity of 123,500 acre-feet. The reservoir will provide roughly 90,000 acre-feet of active storage to help meet future municipal and domestic water demands of non-Indian water providers in New Mexico and the Navajo Nation, and water users in Colorado. In March 2009, the ALP water contractors executed an Intergovernmental Agreement that among other things forms a project operations and maintenance organization and provides principles for the operation of the ALP. The project operations and maintenance organization subsequently entered into an agreement with the USBR to transfer operation, maintenance, and replacement responsibilities to the project participants.

- Several actions regarding transfers of water rights related to municipalities in the region have occurred since completion of the 2003 RWP:

    - In March 2005 the State of New Mexico, the City of Farmington, and the Navajo Nation entered into an Agreement regarding terms of a Consent Order to describe elements of certain of the City's rights to divert and use waters of the San Juan River stream system that derive from State Engineer File No. 2995 or from the Echo Ditch Decree of 1949, including rights decreed to the City and rights pursuant to several permits associated with transfers of water rights from decreed irrigation uses to municipal use.

    - In May 2013 the State of New Mexico and the City of Aztec entered into an Agreement regarding the City's water rights, including quantification of its rights to divert and use waters of the Animas River that derive from State Engineer File No. 2801 or from rights decreed to it by the Echo Ditch Decree.

    - Also in May 2013, the State of New Mexico and the City of Bloomfield entered into an Agreement setting forth conditions for the review and acceptance of transfers to City municipal use of specific irrigation rights.

- In February 2013 the State Engineer and the State of New Mexico entered into agreements with the San Juan Water Commission (SJWC) and the La Plata Conservancy District (LPCD) for settlement of pending litigation and other disputes concerning water rights in which:

    - Water appropriated pursuant to State Engineer File No. 2883 for the ALP that is not needed for the ALP as authorized and constructed under the Colorado Ute Settlement Act Amendments of 2000 was allocated to the SJWC, the LPCD, and the Navajo Nation based on previous ALP allocations to them that were not fully included in the

ALP as now constructed, subject to the use of these additional allocations being administered as junior in priority to the ALP.

  - The State Engineer agreed that return flow plans for quantifying return flow credits for the administration of diversions for municipal, industrial or domestic uses made pursuant to the ALP or the allocations under File No. 2883 will be based on measured return flows, including directly measured wastewater discharges to the San Juan or Animas rivers and indirectly measured return flows to these rivers calculated using a water budget method acceptable to the State Engineer. In September 2015 the State Engineer determined a specific method and standards for such return flow plans and determined that the same method and standards would also apply to certain other water rights held by the SJWC or its member entities.

- The USBR, in cooperation with the seven Colorado River basin states, completed the *Colorado River Basin Water Supply and Demand Study* in 2012. This study evaluated water supply and demand throughout the Colorado River basin—including possible increases in demands for Colorado River basin water in adjoining areas that use water exported from the basin—through the year 2060, reservoir system reliability for meeting water demands in the basin, and opportunities for system operations, demand reductions, and water supply augmentation projects to meet the projected gap in supply and demand. Other than the operation of Navajo Reservoir to meet the SJRBRIP's flow recommendations, the study did not evaluate water administration in the San Juan River Basin in New Mexico or potential shortages to meet water demands in New Mexico. The study also did not assess how deficiencies in deliveries from the Upper Basin to the Lower Basin at Lee Ferry under the Colorado River Compact, if any, might affect water uses in New Mexico.

- Substantive issues related to administration of interstate compacts need to be resolved, including:

  - Quantification of the Upper Basin's obligation to deliver water in the Colorado River at Lee Ferry for purposes of Mexican Treaty deliveries under Article III(c) of the Colorado River Compact, including determination of extraordinary drought.

  - Development of (1) the method for accounting consumptive uses in the Upper Basin pursuant to Article VI of the Upper Colorado River Basin Compact and (2) procedures for implementing any water use curtailments in the Upper Basin pursuant to Article IV of the Upper Colorado River Basin Compact.

  - Resolution of New Mexico's issues with Colorado's performance in making water deliveries at the Colorado-New Mexico state line, as required by Article II.2 of the La Plata River Compact, during the summer and fall months after the snowmelt runoff period ends.

- Administration of ALP operations at the Durango Pumping Plant, including plant bypasses of project water for direct delivery to New Mexico, and at Lake Nighthorse consistent with the ALP Project Compact.

- The Northwestern New Mexico Rural Water Projects Act approved the San Juan Navajo Water Rights Settlement with certain deadlines to be substantially met in order for the settlement to become effective and with certain associated funding authorizations that will require congressional appropriations.

  - The United States must fund and complete rehabilitation of the Fruitland Irrigation Project by the end of 2016 and of the Hogback Irrigation Project by the end of 2019, at a total estimated cost of $23 million (indexed to 2004 dollars).
  - By the end of 2019, the United States must appropriate a total of $50 million to the Navajo Nation Water Resources Development Trust Fund and a total of $30 million (indexed to 2008 dollars) for conjunctive use groundwater wells in the San Juan River basin to supplement the surface water deliveries of the NGWSP to rural communities of the Navajo Nation.
  - Construction of all NGWSP facilities must be completed by the end of 2024, at a total estimated cost of $870 million (indexed to 2007 dollars).

- Due to the large amount of forested land within and upstream of the region, coupled with the recent drought conditions, the threat of wildfire and subsequent sedimentation impacts on streams and reservoirs remains a key planning issue. Continued and expanded efforts to reduce catastrophic fire risk through forest management, as well as additional information on the quantitative benefits of various management techniques, are needed. In particular, quantification of the effectiveness of riparian vegetation removal, upland conifer thinning, and other water salvage methods need further study to support well-informed decisions. Most of the forested land upstream from substantial storage reservoirs and water uses in New Mexico is in Colorado, and most of the usable streamflow in the San Juan River through New Mexico originates in Colorado.

- There is concern about the potential for hydraulic fracturing for oil and gas extraction to contaminate local water resources due to improperly managed surface or casing operations.

- There are several small rural drinking water systems within the region. The maintenance, upgrades, training, operation, and monitoring that is required to ensure delivery of water that meets drinking water quality standards is a financial and logistical challenge for these small systems.

- Water quality in the San Juan and Animas River continues to be a source of concern within the region. A recent study analyzed samples collected from four sites on the San

Juan and Animas rivers in San Juan County and one at the Colorado-New Mexico border. Results from two years of data found human feces bacteria was the most common bacterium.

- Sedimentation within the San Juan River basin continues to be a challenge for water suppliers. During rain and flood events, ephemeral tributaries such as Canon Largo may contribute substantial amounts of sediments into the rivers.

- In 2007 the USBR completed a *Hydrologic Determination of Water Availability from Navajo Reservoir and the Upper Colorado River Basin for Use in New Mexico*. The Hydrologic Determination was made for the purpose of contracting for water from the Navajo Reservoir water supply for the Navajo Nation's uses in New Mexico under the NGWSP. Based on the Hydrologic Determination, depletions from the flow of the Colorado River at Lee Ferry by the Upper Basin states can be reasonably allowed to rise to an annual average of 5.76 million acre-feet excluding evaporation from Colorado River Storage Project (CRSP) storage unit reservoirs other than Navajo Reservoir. As part of the Hydrologic Determination, New Mexico's Upper Basin allocation was determined to be at least 642,380 acre-feet per year excluding the State's share of reservoir evaporation from CRSP storage unit reservoirs (Lake Powell, Flaming Gorge Reservoir, and the Aspinall Unit).

Strategies to Meet Future Water Demand

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

The 2003 San Juan Basin Regional Water Plan recommended the following strategies for meeting future water demand:

- Animas Watershed
  - Additional storage in New Mexico
  - Development of shallow groundwater to improve surface water diversion capabilities
  - Crop leasing during droughts
  - Groundwater exchange with NIIP or Navajo-Gallup facilities
  - Removal of non-native species from riparian areas
  - Cloud seeding
  - Increase Animas-La Plata Project (ALP) storage
  - Storage of stormwater

- Storage in Gallegos Wash
- Treatment of saline waters to drinking water quality
- Enlargement of Farmington Lake

- Blanco Canyon Watershed
  - Erosion control/watershed improvement

- Middle San Juan Watershed
  - Improvements to the operations of Navajo Reservoir

- La Plata Watershed
  - Small reservoir storage (by individuals or ditch companies)
  - Delivery of water from Ridges Basin Reservoir to the Upper La Plata for municipal uses (La Plata Pipeline) through the La Plata Conservancy District in Colorado

- Basin-Wide Alternatives
  - Encourage settlement of the Navajo Nation's water rights
  - Conservation – indoor and outdoor municipal uses
  - Global municipal and irrigation pipeline from Navajo Reservoir
  - Agricultural improvements – on-farm and canal improvements
  - Groundwater exchange to NIIP and/or Navajo-Gallup Pipeline
  - Water Banking
    a. Acquire right to store existing direct flow rights in Navajo Reservoir
    b. Leasing of crops
  - Additional funding for the Office of the State Engineer

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

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

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

- *Watershed, stream, and ecosystem restoration.* Continue landscape-scale watershed restoration to protect/restore water quality. The project includes invasive species treatment, stream and river restoration, and rangeland health and grazing management.

- *Water quality protection.* Implement source water protection plans and recommendations. Continue source water monitoring programs.

- *Protect surface water from upstream contamination from abandoned mine sites.* Identify and address risks from upstream abandoned mine releases, and implement mitigation measures.

- *Top Water Bank Implementation.* Complete planning phase and begin implementation of the pilot water banking program authorized under the Northwestern New Mexico Rural Water Projects Act.

- *Irrigation conveyance system efficiencies and improvement of management practices.* Increase the efficiency of all irrigation systems in the planning region by updating diversion works, installing measuring devices, cleaning ditches, and checking grade for proper slopes. Ditches can also be lined to improve efficiency. On-farm efficiency measures should also be implemented.

- *Water system infrastructure improvements and upgrades.* Address water system maintenance and infrastructure needs to meet future demand through several projects, including expansion and installation of additional water lines, well improvements, sewer system installation and upgrade, storage tank rehabilitation or installation, water rights acquisition and planning documents, water audits, and preliminary engineering reports for water providers in the region.

- *Address land use and water requirements.* Develop a model non-alluvial ordinance. Review and evaluate existing County ordinance to identify changes needed to address: erosion, return flow, and service boundary issues.

The 2016 Regional Water Plan characterizes supply and demand issues and identifies strategies to meet the water needs of the region. 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

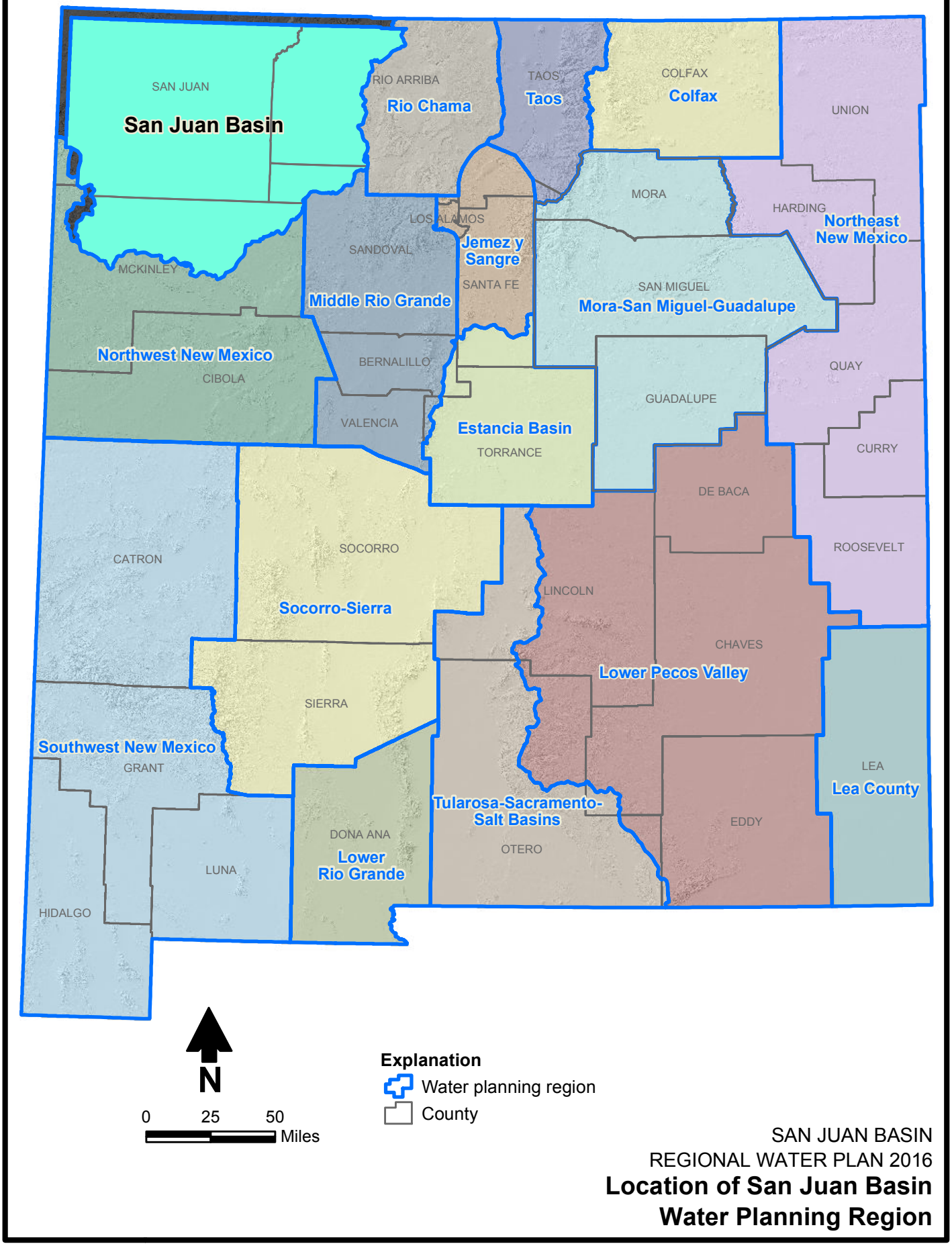
The San Juan Basin Water Planning Region encompasses the New Mexico part of the San Juan Hydrologic Unit, which falls primarily within San Juan County, but includes parts of McKinley, Sandoval, and Rio Arriba counties as well (Figure 1-1). The San Juan region is one of 16 water planning regions in the 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 *San Juan Basin Regional Water Plan* was completed and accepted by NMISC in 2003 (San Juan Water Commission, 2003).

The purpose of this document is to provide new and changed information related to water planning in the San Juan Basin region, as listed in the bullets below, and to evaluate projections of future water supply and demand for the region. Accordingly, the following sections summarize key information in the 2003 plan and provide updated information regarding changed conditions and additional data that have become available. Specifically, this update:

- Identifies significant new research or data that provide a better understanding of current water supplies and demands in the San Juan Basin region.
- Presents recent water use information and develops updated projections of future water demand.
- 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 San Juan Basin region's future water management needs and goals.
- Discusses other goals or priorities as identified by stakeholders in the region.

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

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



SAN JUAN BASIN
REGIONAL WATER PLAN 2016

Location of San Juan Basin Water Planning Region

Figure 1-1

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

- Section 3 provides background information regarding the characteristics of the San Juan Basin planning region, including an overview of updated population and economic data.

- The legal framework and constraints that affect the availability of water are briefly summarized in Section 4, with recent developments and any new issues discussed in more detail.

- The physical availability of surface water and groundwater and water quality constraints was discussed in detail in the 2003 RWP; key information from that plan is summarized in Section 5, with new information that has become available since 2003 incorporated as applicable. In addition, Section 5 presents updated monitoring data for temperature, precipitation, drought indices, streamflow, groundwater levels, and water quality, and an estimate of the available water supply including an estimate of drought supply.

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

- Based on the current water supply and demand information discussed in Sections 5 and 6, Section 7 discusses how supply compares with projected demand in the planning region.

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

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

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

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

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

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

2. Public Involvement in the Planning Process

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

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

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

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

This approach represents a change in the State's role from the initial round of regional water planning, beginning in the1990s through 2008, when the original regional water plans were developed. During that phase of planning, the NMISC granted regions funding to form their own regional steering committees and hire consultants to write the regional water plans, but NMISC staff were not directly involved in the process. Over time, many of the regional steering committees established for the purpose of developing a region's water plan disbanded. Funding for regional planning decreased significantly, and not all regions were 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 San Juan Basin 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 committees members represent the different water users groups identified in the Handbook and have water management expertise and responsibilities.

The steering committee was tasked with four main responsibilities:

- Provide input to the water user and stakeholder 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 *San Juan 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 San Juan Basin 2016 regional water plan.

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

The steering committee includes several state and federal agency representatives who participate or have been recommended as technical resources to the region. These individuals are generally knowledgeable about water issues in the region and are involved with many of the PPPs related to water management in the region. The list also includes non-profit groups who are involved in local water-related initiatives and/or have expertise such as watershed restoration or mutual domestic concerns and issues. The steering committee identified Shaun Bishop of the San Juan Water Commission, as chair.

Table 2-1. Steering Committee Members, San Juan Basin Water Planning Region

Page 1 of 2

Water User Group	Name	Organization / Representation
Agricultural – groundwater user	Not applicable	No irrigation from groundwater reported in this region
Agricultural – surface water user		Navajo Agricultural Products Industries
County government	Emma Deyo	San Juan Soil and Water Conservation District (SWCD)
	Lucia F. Sanchez	Rio Arriba County
	Jeff Kiely	Northwest New Mexico Council of Governments
Environmental interest (recommended as technical support to the region)	Nathan Small	New Mexico Wilderness Alliance
Environmental interest	Dale Lyons	Nature Conservancy
Extractive industry	Mike Greene, Project Manager	PNM, Generation Asset Management
	Steve Dunn	Oil & Gas - Four Corners Economic Development
Federal agency (technical support to the region)	Anthony Madrid	U.S. Forest Service
Federal agency (recommended as technical support to the region)	Pat Page, Project Leader	Navajo-Gallup Water Supply Project, Western Colorado Area Office, U.S. Bureau of Reclamation
	Ed Werner	Navajo-Gallup Water Supply Project, Western Colorado Area Office, U.S. Bureau of Reclamation
	Bernadette Tsosie, Hydrologist	Bureau of Indian Affairs
	Roger Slape	Navajo Area Indian Health Service (IHS officer, assigned to NTUA)
		Navajo Environmental Protection Agency
	Victoria Barr	Bureau of Land Management
	Richard Montoya, District Conservationist	U.S. Department of Agriculture (USDA) Natural Resources Conservation Service Grants
	Evert Oldham	USDA-Rural Development Area Director
	Blane Watson	New Mexico Office of the State Engineer
State agency (technical support to the region)	Brandon Foley	New Mexico State Land Office
	Mary Stuever, District Forester	New Mexico State Forestry

Table 2-1. Steering Committee Members, San Juan Basin Water Planning Region

Water User Group	Name	Organization / Representation
State agency (technical support to the region)	Jeff Kiely, Executive Director	Northwest New Mexico Council of Governments
	Neal Schaeffer	New Mexico Environment Department
Municipal government	Teresa Brevik	City of Bloomfield, Special Projects
	Paul Montoia	City of Farmington, Water Resources
	Joshua Ray	City of Aztec, City Manager
	Larry Hathaway	San Juan County
Other groups as identified by the steering committee	Aaron Chavez	San Juan Water Commission
	Shaun Bishop	San Juan Water Commission
	Jimmy Hodges	San Juan Water Commission
	Benita Litson	Dine College Ag
	Bonnie Hopkins	New Mexico State University Extension
Rural water provider	Lloyd Atliffe	Blanco Mutual Domestic Water Consumers Association (MDWCA) Northstar MDWCA
	Martin Duncan	San Juan River Dineh Water Users
	Aaron Lee	Lee Hammond Water
	Nick Ashcroft	West Hammond Domestic Water
	Keith Lee	Lower Valley Water Users Association
Tribal	Jason John, Branch Manager	Department of Water Resources Navajo Nation
		Navajo Water Rights Commission
Watershed interest	Melissa May	San Juan SWCD
	Dave Tomko	San Juan Watershed Group
	Ann Oliver	Animas Watershed Partnership

The steering committee discussed the value of developing subcommittees but no action was taken.

2.2.2 Regional Water Plan Update Meetings

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

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

- The steering committee agreed that weekday afternoons would be the best time to hold meetings.
- Farmington is the best location for meetings.
- The San Juan Water Commission would host a steering committee meeting to provide input and comments on the plan.
- Steering committee members would continue to assist with outreach.

The steering committee took the lead in obtaining comments on the planning process. A press release for soliciting public comment on the draft RWP was published and also posted to entity websites. The public comment period was from March 1 through April 1, 2016. All comments were to be directed to the San Juan Water Commission. Following the public comment period, all comments were compiled by the steering committee, and the San Juan Water Commission hosted a steering committee meeting, facilitated by Shaun Bishop, on April 6, 2016 at 1:00 p.m. to review and discuss the comments. Comments were received from PNM and steering committee members; no other public comments were received. All comments were compiled into a single document and submitted to the NMISC for review.

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

Table 2-2. San Juan Basin Region Public Meetings

Date	Location	Purpose	Meeting Summary
FY 2014			
7/27/2014	Farmington	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.
12/4/2014	Farmington	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.
FY 2015			
5/28/2015	Farmington	Review the update process and the timeline for completing the regional water plan (RWP) update.	The group reviewed the update process and the technical data, which was important for new people who had not attended meetings before, and the timeline for updating the RWP. The steering committee membership and leadership were affirmed, with alternates named as appropriate. The group further discussed where future meetings would be held and the time that worked the best for getting the most attendance. At this meeting, the group also discussed new information from the region and/or the projects, policies, programs (PPPs) that had been implemented since the last plan. 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. San Juan Basin Region Public Meetings

Date	Location	Purpose	Meeting Summary
6/3/2015	Farmington	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 reviewed projects completed since submission of the accepted plan and provided additional input. The group discussed potential collaborative projects such as agriculture/ acequia projects, water system regionalization/cooperation, monitoring/data collection, watershed restoration, drought contingency planning, shortage sharing agreements, municipal conservation and reuse, local and state water policy recommendations, and water quality protection. The future project checklist that had been sent to participants by e-mail and discussed at other meetings was reviewed and discussed, and a deadline for sending information to the consultants was confirmed. The group participated in a brainstorming activity that helped to identify regional projects that held the potential for the greatest collaboration and effort.
FY 2016			
2/29/2016	Farmington	Review steering committee membership and leadership. Focus on the PPPs to be included in the update and the process for submitting comments to the draft RWP.	The group reviewed the steering committee membership and suggested additional members to fill vacancies and decided that steering committee leadership would be Shaun Bishop, San Juan Water Commission. Subcommittees that had met reported to the group. The steering committee and interested stakeholders present participated in a brainstorming activity that helped to identify and rank (although ranking of projects for funding priority is not part of the regional water planning update process) regional projects that held the potential for the greatest collaboration and effort. The consultants affirmed the next steps for the RWP update effort and scheduled the next meeting for Tuesday, April 13, 1:00 p.m., at the San Juan Water Commission building.
4/6/2016	Farmington	Review and compile any public comments and steering committee comments.	The steering committee met to review and compile comments received on the plan.

Table 2-2. San Juan Basin Region Public Meetings
Page 3 of 3

Date	Location	Purpose	Meeting Summary
4/13/2016	Farmington	Refine the key collaborative PPP recommendations specific to Section 8.	The group identified a number of projects that would potentially have greater interest and benefit multiple stakeholders, and discussed and identified key program and policy recommendations. The final meeting was scheduled for May 24, 2016.
4/24/2016	Farmington	Review the Public Involvement section (2) and the Section 8 key strategies and PPP list.	The group reviewed Sections 2 and 8 of the plan as well as the PPP spreadsheet and the single comment document. Edits and input to the plan were noted and agreed upon for inclusion in these sections.

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

The steering committee recognized ongoing support for implementation of the San Juan Basin Regional Water Plan as the key process for future water planning and public outreach.

3. Description of the Planning Region

This section provides a general overview of the San Juan Basin Water Planning Region. Detailed information, including maps illustrating the land use and general features of the region, and detailed information about seven watersheds was provided in the 2003 RWP. General updated information about the region is briefly summarized 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 San Juan Basin Water Planning Region is located in northwest New Mexico. The region is bounded on the north by Colorado, on the west by Arizona, on the southeast and east by the continental divide, on the south by the divide between the Little Colorado River Basin and the San Juan Basin, and on the far southwest by the Chuska Mountains. The region encompasses all of San Juan County and parts of McKinley, Rio Arriba, and Sandoval counties (Figure 1-1). Additionally, parts of the Navajo Reservation and Jicarilla Apache Nation are located within the San Juan Basin Water Planning Region.

The total area of the planning region is 9,672 square miles, distributed among the four counties as follows:

- San Juan County: 5,429 square miles
- Rio Arriba County: 2,023 square miles
- McKinley County: 1,813 square miles
- Sandoval County: 406 square miles

Non-renewable resources in the region include natural gas, oil, and coal. Renewable resources in the region include lumber and wood products, rangeland, solar power, and wind power. The Carson National Forest, managed by the U.S. Forest Service, and lands managed by the U.S. Bureau of Land Management cover parts of the San Juan Basin region and provide commercial and recreational opportunities in the region.

3.2 Climate

Climatic conditions vary widely in the region, based on elevation and topography. Given this variation, along with the limited number of weather stations, region-wide generalizations regarding the region's climate are problematic. Based on the available data, long-term average temperatures vary from mean highs of 63 degrees Fahrenheit (°F) to mean lows of 26°F in the higher elevations, and precipitation varies from under 6 to over 30 inches per year.

3.3 Major Surface Water and Groundwater Sources

The primary source of water for all purposes in the San Juan Basin planning region is surface water. The primary surface water source in the San Juan Basin region is the San Juan River and its tributaries; the primary tributaries in the region are the Animas River, Canon Largo, Chaco River, and La Plata River (Figure 3-1). Navajo Reservoir, a major reservoir with 1.7 million acre-feet of storage capacity, impounds the San Juan River in this region and extends into Colorado. The San Juan River watershed is shared with Colorado, Utah, and Arizona, but not with any other New Mexico planning regions. The San Juan Basin planning region includes seven watersheds. The 2003 plan provides detailed information about water supply, demand, and water needs within each watershed.

The groundwater within the study area is within the San Juan Structural Basin, located in Arizona, Utah, Colorado, and New Mexico. Approximately 9,700 square miles of the basin falls within the San Juan region. Many of the groundwater resources in the region are saline, making their use economically unviable for most purposes; however, some formations yield good-quality groundwater suitable for municipal, domestic, and stock uses.

The sole NMOSE-declared underground water basin (UWB) in the region is the San Juan UWB. (A declared UWB is an area of the state proclaimed by the State Engineer to be underlain by a groundwater source having reasonably ascertainable boundaries. By such proclamation the State Engineer assumes jurisdiction over the appropriation and use of groundwater from the source.) This basin lies almost entirely within the San Juan Basin Water Planning Region (except for an insignificant portion of the San Juan UWB near the Arizona border that lies within the Northwest New Mexico region) and is therefore for all practical purposes not shared with any other water planning region. 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

The San Juan Region includes almost all of San Juan County, as well as small portions of McKinley, Rio Arriba, and Sandoval counties. The 2013 population of San Juan County was 126,503 (U.S. Census Bureau, 2014a). A significant portion of the region lies within the Navajo Reservation.

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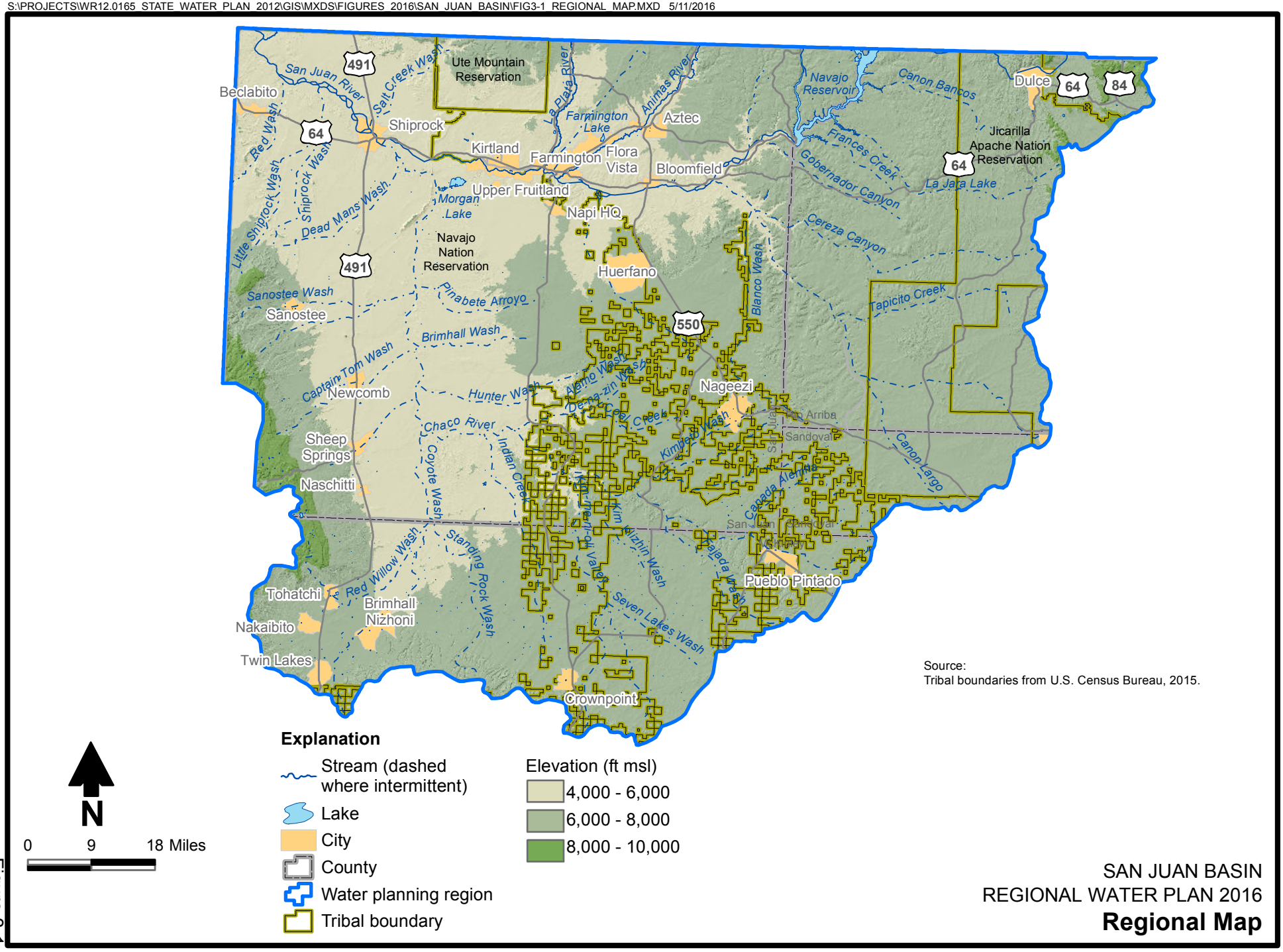

Source:
Tribal boundaries from U.S. Census Bureau, 2015.

Figure 3-1

SAN JUAN BASIN
REGIONAL WATER PLAN 2016
Regional Map

As shown in Table 3-1, San Juan and Sandoval counties experienced a high rate of population growth overall from 2000 to 2010, while McKinley and Rio Arriba counties experienced overall declines. Since 2010, however, the population of McKinley County has rebounded somewhat, while the San Juan County population has declined. The largest employment categories in the region are education/healthcare, mining, agriculture, forestry, retail trade, tourism-related services (arts, entertainment, recreation, hospitality, and food services), transportation and utilities, construction, and professional and scientific services. Agriculture is the largest water user in San Juan County, followed by power plants and reservoir evaporation.

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

- Federal agencies: 2,471 square miles
- Tribes: 6,048 square miles
- State agencies: 368 square miles
- Private entities: 839 square miles

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

4. Legal Issues

4.1 Relevant Water Law

4.1.1 State of New Mexico Law

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

Table 3-1. Summary of Demographic and Economic Statistics for the San Juan Basin Water Planning Region

a. Population

County	2000 Total	2010		2013
		Total	Within Region [a]	
San Juan	113,801	130,044	129,634	126,503
Rio Arriba	41,190	40,246	3,889	40,072
McKinley	74,798	71,492	11,396	73,308
Sandoval	89,908	131,561	1,032	136,575
Total Region	319,697	373,343	145,951	376,458

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

[a] U.S. Census Bureau, 2010

b. Income and Employment

County	2008-2012 Income [a]		Labor Force Annual Average 2013 [b]		
	Per Capita ($)	Percentage of State Average	Number of Workers	Number Employed	Unemployment Rate (%)
San Juan	21,561	91	55,423	51,704	6.7

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

[b] NM Department of Workforce Solutions, 2014

c. Business Environment

County	Industry	Number Employed	Number of Businesses
	2008-2012 [a]		*2012* [b]
San Juan	Education, health care	12,177	
	Mining, agriculture, forestry	6,748	
	Retail trade	6,353	
	Arts, entertainment, recreation, lodging, dining	4,480	2,830
	Transportation, utilities	4,045	
	Construction	3,779	
	Professional, scientific, management	3,241	

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

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

Table 3-1. Summary of Demographic and Economic Statistics for the San Juan Basin Water Planning Region

d. Agriculture

County	Farms / Ranches [a]			Most Valuable Agricultural Commodities [b]
	Number	Acreage		
		Total	Average	
San Juan	2,628	2,580,319	982	Vegetables, melons, potatoes Other crops and hay Cattle, calves Sheep, wool

[a] USDA NASS, 2014, Table 1

[b] USDA NASS, 2014, Table 2

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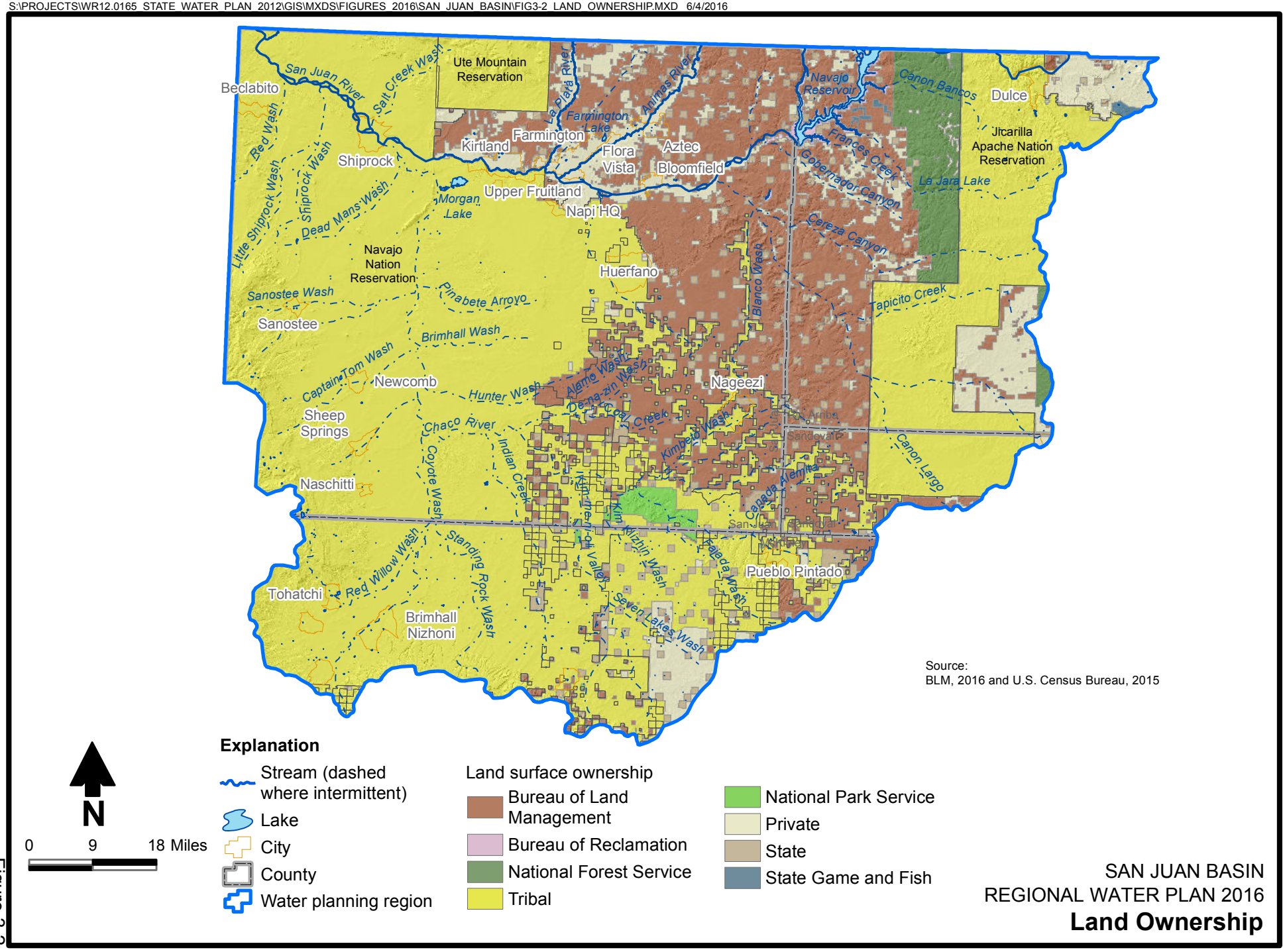

Figure 3-2

SAN JUAN BASIN
REGIONAL WATER PLAN 2016

Land Ownership

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) (2003). 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 San Juan Basin 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 is, 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 (ac-ft/yr) 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 San Juan Basin is not a priority basin for the NMISC.

4.1.1.10 Acequia Water Use

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

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

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

provided for another review procedure for the decisions of acequia commissioners by enacting Section 73–2–21(E).

The Owners second assertion was that the deferential standard of review in Section 73-2-21(E) violated the equal protection clause of Article II, Section 18 of the New Mexico Constitution. The Owners argued that their equal protection guarantees were violated because water rights transfers out of acequias were treated differently than other water rights transfers. The court again disagreed, finding that although other determinations of water rights are afforded a *de novo* hearing in the district court, since the Owners still had access to the courts and the right of appeal, there were no equal protection violations.

4.1.1.11 Water Conservation

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

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

4.1.1.12 Municipal Condemnation

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

4.1.1.13 Subdivision Act

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

4.1.2 State Water Laws and Administrative Policies Affecting the Region

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

4.1.2.1 Water Masters

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

4.1.2.2 Groundwater Basin Guidelines

The NMOSE has declared UWBs and implements guidelines in those basins for the purpose of carrying out the provisions of the statutes governing underground waters. *See* NMAC 19.27.48.6. The sole groundwater basin within the region is the San Juan UWB (Figure 4-1). The administration of the San Juan UWB is discussed in depth in Section 6.1.2.1of the 2003 plan. No specific groundwater regulations govern the basin.

4.1.2.3 AWRM Implementation in the Basin

The San Juan Basin has been designated as a priority basin for implementation of AWRM regulations, but AWRM regulations have not yet been implemented.

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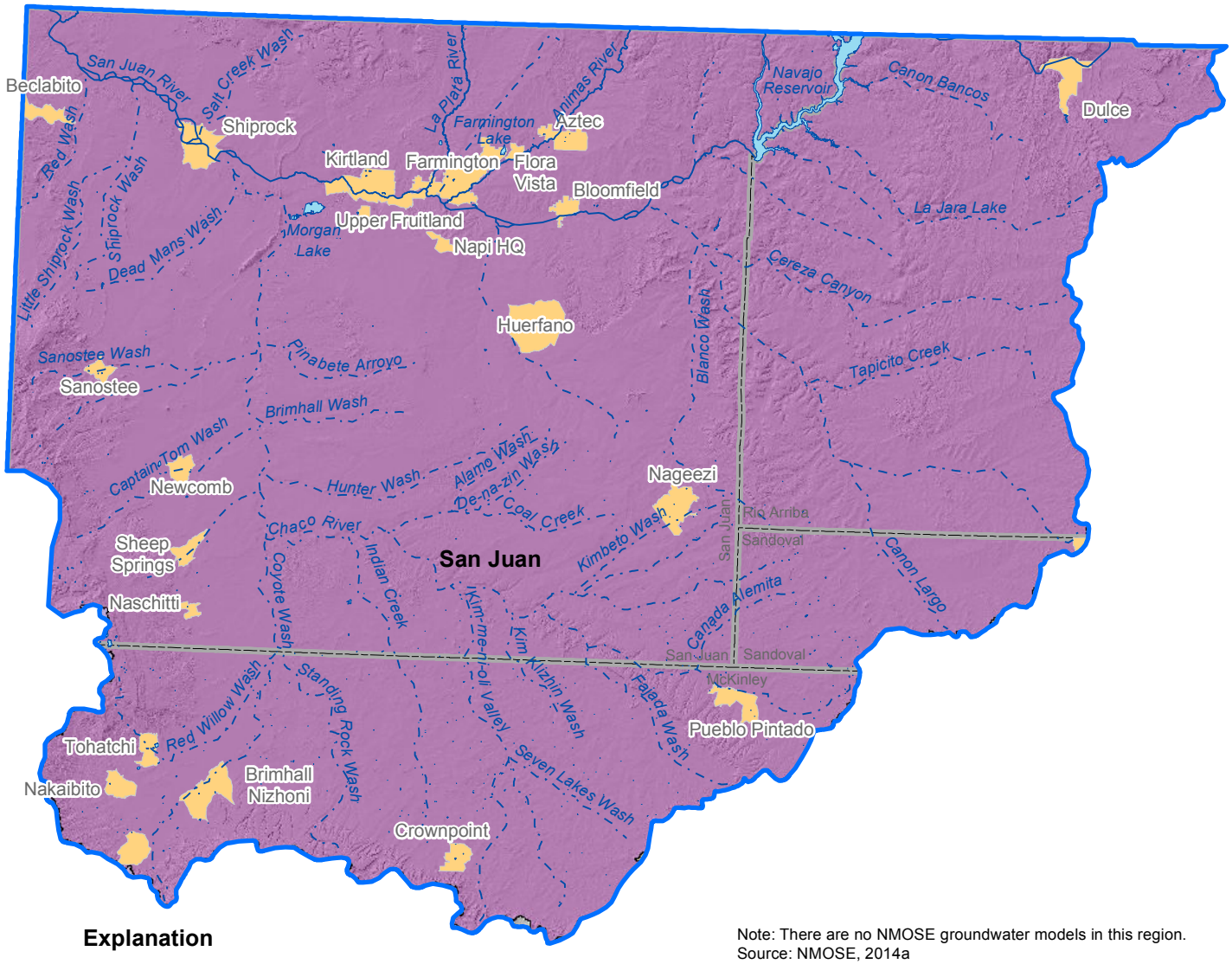

Explanation

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

NMOSE-declared groundwater basin

- San Juan

Note: There are no NMOSE groundwater models in this region.
Source: NMOSE, 2014a

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0 9 18 Miles

Figure 4-1

SAN JUAN BASIN
REGIONAL WATER PLAN 2016

NMOSE-Declared Groundwater Basins and Groundwater Models

4.1.2.4 Special Districts in the Basin

Special districts are discussed in depth in the 2003 Plan, Section 6.4.3. 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. Special districts in the San Juan Basin region include:

- Multiple water users associations
- Bloomfield Irrigation District
- Farmers Irrigation District
- Hillside Irrigation District
- Hammond Conservancy District
- La Plata Conservancy District
- Multiple ditch companies
- Multiple soil and water conservation districts (SWCDs)

4.1.2.5 State Court Adjudications in the Basin

The pending adjudication in the San Juan Basin region is the *State of Mexico, ex rel. State Engineer v. United States, et al.*, CV-75-184 (11th Judicial District, San Juan County, New Mexico) (San Juan River General Stream Adjudication). The adjudication includes the claims of the Navajo Nation, Case No. AB-07, as shown by the following timeline:

- April 19, 2005: San Juan Basin/Navajo Nation Water Rights Settlement (between the State of New Mexico, the Navajo Nation, and the United States to resolve the claims of the Navajo Nation's use of water in the San Juan Basin). Major elements of the Settlement include:
    - The Settlement provides water rights and associated water development projects, including the Navajo-Gallup Water Supply Project, for the benefit of the Navajo Nation in exchange for a release of claims to water that potentially might otherwise displace existing non-Navajo water uses.
    - The rights of the Navajo Nation under the Settlement are based upon existing irrigation projects (Navajo Indian Irrigation Project, Fruitland-Cambridge Irrigation Project, Hogback-Cudei Irrigation Project, and other tributary irrigation projects).
    - The rights of the Navajo Nation to municipal, industrial, commercial and domestic uses will be supplied by the Navajo Gallup Water Supply Project, Animas-La Plata Project, San Juan River diversions, groundwater diversions, and undetermined tributary diversion.

- The Settlement also includes shortage sharing provisions.

- March 30, 2009: Settlement Legislation approved and signed into law by the President (P.L. 111-11).

- December 2010: Final conformed Settlement Agreement executed by New Mexico, Navajo Nation, and Department of Interior.

- November 1, 2013: Partial Final Judgment and Decree of the Water Rights of the Navajo Nation (sets forth the rights of the Navajo Nation to use and administer waters of the San Juan River Basin; on appeal before the New Mexico Court of Appeals.)

- November 1, 2013: Supplemental Partial Final Judgment and Decree of the Water Rights of the Navajo Nation (quantifies certain reserved rights of the Navajo nation for historical and existing uses within the Basin from tributaries and groundwater, and state-law based water rights of the Navajo Nation; on appeal before the New Mexico Court of Appeals.)

Other sections of the San Juan Adjudication, along with the current status of work in each section, are:

- Section 1: La Plata. Primary subfile work ongoing (entry of subfile orders); mediation or litigation of disputed subfile (surface water claims).

- Section 2: San Juan Mainstream: No activity, first step will be to conduct hydrographic survey.

- Section 3: Hammond Conservancy District: No activity, first step will be to conduct hydrographic survey.

- Section 4: Animas: No activity, first step will be to conduct hydrographic survey.

- Section 5: Los Pinos and Navajo rivers: No activity, first step will be to conduct hydrographic survey.

- Section 6: Indian Claims:
  - Navajo claims (see above)
  - Ute Mountain Ute claims: An expedited inter se proceeding is scheduled with the court.

4.1.2.6 Court Decrees

Decrees that govern water use in the San Juan Basin region are discussed in the 2003 plan, Section 6.1.2.1.1. They include:

- The Echo Ditch Decree
- Partial Final Judgment and Decree of the Water Rights of the Jicarilla Apache Tribe, No. 75-184-1 (11th Judicial District, San Juan County, New Mexico)(02/22/1999).
- Partial Final Judgment and Decree of the Water Rights of the Navajo Nation, CV-75-184 (11th Judicial District Court, San Juan County, NM) (11/1/2013). On appeal to the New Mexico Court of Appeals.
- Supplemental Partial Final Judgment and Decree of the Water Rights of the Navajo Nation, CV-75-184 (11th Judicial District Court, San Juan County, NM) (11/1/2013). On appeal to the New Mexico Court of Appeals.

4.1.3 Federal Water Laws

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

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

4.1.3.1 Federal Reservations

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

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

Lands with federal reserved rights within the San Juan Basin planning region include the following:

- Navajo Nation
- Jicarilla Apache Tribe
- Ute Mountain Ute Tribe
- Carson National Forest
- Chaco Culture National Historic Park
- Bureau of Land Management Lands
- Bureau of Land Management Wilderness Areas

4.1.3.2 Interstate Stream Compacts

The interstate compacts in the San Juan Basin region are the Colorado River Compact, the Upper Colorado River Compact, the Animas-La Plata Project Compact, and the La Plata River Compact. These are discussed in the 2003 plan, Section 6.2.1.

4.1.3.3 Treaties

The Colorado River, of which the San Juan, Animas, and La Plata rivers are tributaries, is subject to a 1944 international treaty between the United States and Mexico. See *Treaty of the United States and Mexico on the Utilization of the Waters of Colorado and Tijuana Rivers and of the Rio Grande*, Feb. 3, 1944, U.S.-Mexico, T.S. No. 994.

4.1.3.4 Federal Water Projects

There are a number of federal water projects in the San Juan Basin region. They include:

- The Navajo Dam and Reservoir: The largest single user of the reservoir is the Navajo Indian Irrigation Project (discussed below). The Bureau of Reclamation completed its environmental compliance and Record of Decision for the Navajo Reservoir Re-operation allowing the operation of the reservoir in a manner supporting the recovery of endangered species while enabling further development of the San Juan River.

- The Navajo Indian Irrigation Project is discussed in the 2003 plan, Section 6.2.2.1. Within the project, 80,000 of 110,000 authorized acres have been constructed, and diversion and depletion amounts are limited by the Navajo Indian Water Rights Settlement (discussed below).

- The San Juan-Chama Project is discussed in the 2003 plan, Section 6.2.2.2.

- The Hammond Irrigation Project is discussed in the 2003 plan, Section 6.2.2.3.

- The Animas-La Plata Project is discussed in the 2003 plan, Section 6.2.2.4. The Colorado Ute Settlement Act Amendments of 2000 provide for implementation and completion of the project in order to provide a municipal and industrial (drinking) water supply. Construction on the Colorado portion of the Project is complete, and pipe laying operations for the Navajo Nation Municipal Pipeline (NNMP) were completed in July 2012. Funding for construction of improvements has been authorized through the Navajo Nation Water Rights Settlement and will consist of 29 miles of pipe that will transport 4,680 ac-ft/yr of water from the City of Farmington to Shiprock. The diversion and depletion amounts for the Project are limited by the Navajo Indian Water Rights Settlement

- The Navajo-Gallup Water Supply Project is discussed in the 2003 plan, Section 6.2.2.5. The project currently is under construction and will supply water from the Navajo Reservoir to 43 Navajo chapters, the Jicarilla Apache Nation, and the Gallup area. Funding for the project is authorized through the federally authorized Navajo Indian Water Rights Settlement (*Northwestern New Mexico Rural Water Projects Act*, Public Law 111-11, Title X, Subtitle B), which also limits the diversion and depletion amounts for the Project; specifically, the Project will result in a diversion of 22,650 acre-feet and a depletion of 20,780 acre-feet from the San Juan River.

- The Hogback and Fruitland Irrigation Projects will be rehabilitated through funds provided by the Navajo Nation Water Rights Settlement.

4.1.3.5 Federal Adjudications in the Basin

Not applicable.

4.1.4 Tribal Law

Within the San Juan Basin region, both the Jicarilla Apache and Navajo Nations have water codes. The Ute Mountain Ute Tribe does not have a specific water code.

Water use on the Jicarilla Apache Nation is governed by its Water Code, Title 21. The Jicarilla Water Code is administered by a Water Commission, Title 21, Chap. 3, § 6. The Code includes provisions for the use and permitting of groundwater and surface water, Chap. 4, §§ 5, 6 and Chap. 7, §§ 3, 4; the transfer of permitted water uses, Chap. 10; water marketing, Chap. 15; conservation, Chap. 16, § 5; and priority enforcement, Chap. 17.

The Jicarilla Apache Nation also has a Water and Wastewater Utility Code, Title 24, which includes provisions for conservation, Chap. 3, § 6.

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

4.1.5 Local Law

Local laws addressing water use have been implemented by both municipalities and counties within the planning region. Those laws for San Juan and McKinley counties are discussed below. The region also includes small portions of Rio Arriba and Sandoval counties; local law from Rio Arriba County is discussed in the Jemez y Sangre Regional Water Plan, and local law for Sandoval County is discussed in the Middle Rio Grande Regional Water Plan.

4.1.5.1 San Juan County

Water use in San Juan County is regulated through ordinances and guided by the San Juan County Growth Management Plan Update (Sites Southwest, LLC, 2012).

The San Juan County Subdivision regulations address the water supply requirements for subdivisions. Section 8.8 of the regulations requires that all subdividers provide a water supply plan. If the subdivider intends to provide a domestic water supply, 0.3 acre feet per parcel per year of water must be allocated for each dwelling, unless supplemental irrigation, xeriscaping, or

mandatory water conservation is provided or other mitigating circumstances exist. Section 8.9 of the subdivision regulations requires conformance with certain water quality requirements.

The *San Juan County Growth Management Plan Update* incorporates the Water and Wastewater Element from an earlier 2007 Plan. Goals include protection of surface and groundwater quality, protection of an adequate supply of water for domestic and industrial uses, consideration of the regionalization of County water districts, provision of an adequate supply of water for agricultural water purposes, achieving regional efficiencies in the supply, treatment, and distribution of water and in the collection and treatment of wastewater. The plan also discusses coordination of water and wastewater planning with land use planning, funding of water and wastewater systems, and drought preparedness.

4.1.5.2 City of Aztec

Water use in the City of Aztec is governed by the City Code, the *City of Aztec Water Conservation Plan* (2003), and the *City of Aztec Comprehensive Plan Update* (Sites Southwest, 2002).

The City's subdivision regulations address water sources for development, Section 23-112. The City Code also adopts a water conservation plan for the purpose of allocating and conserving water during periods of water shortage and maintaining a uniform approach toward water use restrictions, Section 25-86.

The Water Conservation Plan sets forth year-round conservation measures to reduce water use to decrease demand, decrease water bills, reduce per capita water consumption, preserve current water supplies, and create best water use practices for City water customers in a semiarid area.

The Comprehensive Plan addresses water resources. Goals outlined in the plan include providing adequate water service to developing areas consistent with the growth management goals of the plan.

4.1.5.3 City of Bloomfield

Water use in the City of Bloomfield is regulated through its Municipal Code, its subdivision ordinance, and the *City of Bloomfield Comprehensive Plan 2007-2017* (NWNMCOG, 2007).

The Land Subdivision Regulations of the City of Bloomfield, New Mexico, Ordinance No. 103, Art. III(H), require property owners in subdivisions to transfer to the City an amount of water rights equal to the amount of treated water to be furnished by the City to the owners of property within the proposed subdivision. The City's Code prohibits water waste, Section 18-19, and has provisions for emergency water conservation, Section 18-28.

The comprehensive plan includes the goal of constructing and maintaining a safe and adequate water supply, treatment, and distribution system that meets current needs and projected demands for future development.

4.1.5.4 City of Farmington

Water use in the City of Farmington is regulated through its Municipal Code and guided by the *Farmington Comprehensive Plan* (Wilbur Smith Associates, 2002).

Under the Farmington municipal code, if a water shortage occurs in the City water system, the city council may implement water conservation measures, Sections 26-2-31 through 37. Farmington's subdivision regulations require that all subdivisions be provided with water supply and distribution systems for fire protection and domestic use either by the City or a water supply district in accordance with the City of Farmington's Water Service Policy, Section 6.4.11.

The comprehensive plan includes the goal of providing and maintaining public utilities, municipal services, and community facilities that encourage orderly growth, enhance quality of life, and promote Farmington as a desirable community. To achieve this goal, the Plan recommends that the City prepare a 40-Year Water Plan consistent with the requirements of the State Engineer, including a thorough inventory of water rights and assessment of additional water rights from the San Juan River. The comprehensive plan also includes the goals of preserving, protecting, and enhancing Farmington's natural resources and encouraging development that is compatible with the natural environment, as well as enhancing and improving water quality.

4.1.5.5 Shiprock

Shiprock is located on the Navajo Nation; therefore, tribal law (Section 4.1.4) applies.

4.1.5.6 McKinley County

Water use in McKinley County is governed by subdivision regulations and the *McKinley County Comprehensive Plan Update* (McKinley County, 2012).

The County's subdivision regulations require that subdivisions containing 20 or more parcels, with at least one parcel of 2 acres or less, must have a State Engineer permit to appropriate or transfer water, Section 5.6. Appendix B of the regulations outlines water availability requirements, and Appendix C outlines water quality requirements.

The comprehensive plan update sets the goals of ensuring a long-term, sustainable, and good-quality water supply for County residents and increasing access by County households to a public water supply. One strategy to meet these goals is to encourage water conservation measures.

4.1.5.7 Crownpoint and Tohatchi

These communities are located on the Navajo Nation; therefore, tribal law (Section 4.1.4) applies.

4.1.5.8 Dulce

Dulce is located on the Jicarilla Apache Nation; therefore, tribal law (Section 4.1.4) applies.

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.*

Below are some of the species in the planning region that are subject to protection under the ESA:

- Yellow-billed cuckoo (threatened): McKinley and San Juan counties
- Mexican spotted owl (threatened; implementation of final recovery plan): McKinley County
- Southwestern willow flycatcher (endangered; implementation of final recovery plan): McKinley and San Juan counties
- Zuni bluehead sucker (endangered): McKinley and San Juan counties
- Sprague's pipit (candidate): San Juan County
- Colorado pikeminnow (endangered; implementation plan): San Juan County
- Razorback sucker (endangered; implementation plan): San Juan County

Of the threatened and endangered species found in the San Juan region, the protection and recovery of the yellow-billed cuckoo, southwestern willow flycatcher, Zuni bluehead sucker, Colorado pikeminnow, and razorback sucker are most likely to affect water planning within the region because all rely on riparian habitat. In particular, any actions that are likely to harm the habitat used by these species will be subject to strict review and possible limitation.

In relation to the Colorado pikeminnow and razorback sucker it is important to discuss the San Juan Recovery Implementation Program. The San Juan Recovery Implementation Program is a multi-state, cross-agency effort to conserve populations of Colorado pikeminnow and razorback sucker in the San Juan River Basin while allowing water development and use in the basin to proceed in compliance with interstate compacts and other applicable laws. In 2003, the USFWS issued recovery plans and goals for both species. Under the plans, development and maintenance of the San Juan River populations to specific population goals are integral to achieving delisting and recovery of both the Colorado pikeminnow and the razorback sucker. Program participants include the states of New Mexico and Colorado, various federal agencies, the Navajo Nation, Jicarilla Apache Tribe, and the Southern Ute Indian Tribe.

4.2.1.2 New Mexico Wildlife Conservation Act

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

The Act authorizes the New Mexico Department of Game and Fish to conduct investigations of indigenous New Mexico wildlife species suspected of being threatened or endangered to

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

Pursuant to the Act, the Commission has listed over 100 wildlife species—mammals, birds, fish, reptiles, amphibians, crustaceans, and mollusks—as endangered or threatened. 19.33.6.8 NMAC. As of August 2014, 62 species were listed as threatened, and 56 species were listed as endangered. *Id.* In the San Juan Basin Water Planning Region, all of the federally listed species discussed above are protected also under the New Mexico Act.

4.2.2 Water Quality Laws

4.2.2.1 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). There are numerous river segments in the San Juan Basin planning region 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

The Indian Tribes within the San Juan Basin region have adopted water quality standards.

- Navajo Nation: Navajo Nation Surface Water Quality Standards 2007 (adopted May 13, 2008).
- Jicarilla Apache Nation: The Jicarilla Apache Nation Code, Title 14, adopts the State of New Mexico surface and groundwater quality standards.
- Ute Mountain Ute: Water Quality Standards for Surface Waters of the Ute Mountain Ute Indian Reservation (January 20, 2011); Ute Mountain Ute Tribe Ground Water Protection Plan (March 2004).

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

There are ongoing legal challenges to the Navajo Nation Water Rights Settlement, the outcome of which will impact water planning in the region. The San Juan Adjudication continues to progress, which again is extremely important to water allocation in the region.

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

5. Water Supply

This section provides an overview of the water supply in the San Juan Basin 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 available 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 2003 *San Juan Basin Regional Water Plan* (San Juan Water Commission, 2003) and, where appropriate, updated with more recent information and data from a number of sources, as referenced throughout this section.

Currently some of the key updates and issues regarding water supplies in the San Juan Basin region are:

- In 2006 the Bureau of Reclamation (USBR) completed a Final Environmental Impact Statement and Record of Decision (ROD) on operations of Navajo Reservoir on the San Juan River that provide for either operating the reservoir to meet Navajo Reservoir water supply contract deliveries and the San Juan River Basin Recovery Implementation Program's (SJRBRIP's) flow recommendations for the San Juan River below Farmington, or providing a suitable alternative to the flow recommendations depending upon hydrologic conditions. Operating the reservoir in accordance with the ROD and the SJRBRIP's flow recommendations helps to provide Endangered Species Act (ESA) compliance for federal water development and water management activities in the San Juan River basin.

- Surface water supplies the majority of water uses in the San Juan Basin region, making the region vulnerable to shortages during times of extreme or extended drought when

reservoir storage might be exhausted. In response to extreme drought in 2002, the major water users from the San Juan River in New Mexico, beginning in 2003, developed recommendations for annual river operations and administration within New Mexico that include maximum diversion rates or amounts for each of the major water users or associated uses and provisions for sharing water supply shortages. The latest agreement on such recommendations covers the period 2013 through 2016, and negotiations for a new agreement covering the period 2017 through 2020 are nearly complete. There is no similar shortage sharing agreement on the Animas River, which is a challenge for operations and water users during times of drought. On the La Plata River, diversions are administered by priority, and by July of each year, streamflow is typically insufficient to meet diversion demands. Similarly, there are insufficient streamflows in the Chaco River drainage and insufficient reservoir storage to adequately irrigate historical Navajo Reservation farmlands in and near the Chuska Mountains or elsewhere in the drainage.

- The Northwestern New Mexico Rural Water Projects Act (Public Law 111-11, Title X, Subtitle B), which was passed by Congress and signed into law in March 2009, approved the San Juan River Basin in New Mexico Navajo Nation Water Rights Settlement Agreement (San Juan Navajo Water Rights Settlement) and authorized construction of the Navajo-Gallup Water Supply Project (NGWSP) to service municipal and domestic water demands of the Navajo Nation, the Jicarilla Apache Nation, and the City of Gallup. The Act also authorizes funding for rehabilitation of the Hogback and Fruitland irrigation projects on Navajo Reservation lands in the San Juan River valley. A final San Juan Navajo Water Rights Settlement conforming to the provisions of the Act and a related Navajo Reservoir water supply contract for the Navajo Nation were executed in December 2010. In November 2013 the Court in the San Juan River Adjudication entered two significant rulings:
    - A Partial Final Judgment and Decree of the Water Rights of the Navajo Nation (Navajo Decree) defining the rights of the Navajo Nation in New Mexico to divert and use water from the San Juan River, including Navajo Reservoir, and from the Animas River and groundwater
    - A Supplemental Partial Final Judgment and Decree of the Water Rights of the Navajo Nation (Navajo Supplemental Decree) defining the rights of the Navajo Nation in New Mexico to divert, store, and use waters from ephemeral tributaries to the San Juan River, including in the Chaco River drainage.
- The Northwestern New Mexico Rural Water Projects Act also authorized funding of up to $11 million to be appropriated through federal fiscal year 2019 for the repair, rehabilitation, or reconstruction of non-Navajo irrigation diversion and ditch facilities in the San Juan River basin in New Mexico to improve water use efficiency. The

application of federal funding for such improvements to irrigation canal distribution systems and on-farm irrigation practices is subject to 50 percent non-federal cost-sharing.

- The USBR completed the Animas-La Plata Project (ALP) as authorized by the Colorado Ute Settlement Act Amendments of 2000 (Public Law 106-554, Title III), which will provide water supplies for municipal, industrial, and domestic uses in Colorado and New Mexico. Lake Nighthorse, the pumped-storage facility for the ALP, was completed and filled in June 2011 with a total storage capacity of 123,500 acre-feet. The reservoir will provide roughly 90,000 acre-feet of active storage to help meet future municipal and domestic water demands of non-Indian water providers in New Mexico, the Navajo Nation, and water users in Colorado. In March 2009, the ALP water contractors executed an Intergovernmental Agreement that among other things forms a project operations and maintenance organization and provides principles for the operation of the ALP. The project operations and maintenance organization subsequently entered into an agreement with the USBR to transfer operation, maintenance, and replacement responsibilities to the project participants.

- Several actions regarding transfers of water rights related to municipalities in the region have occurred since completion of the 2003 RWP:

    - In March 2005 the State of New Mexico, the City of Farmington, and the Navajo Nation entered into an Agreement regarding terms of a Consent Order to describe elements of certain of the City's rights to divert and use waters of the San Juan River stream system that derive from State Engineer File No. 2995 or from the Echo Ditch Decree of 1949, including rights decreed to the City and rights pursuant to several permits associated with transfers of water rights from decreed irrigation uses to municipal use.

    - In May 2013 the State of New Mexico and the City of Aztec entered into an Agreement regarding the City's water rights, including quantification of its rights to divert and use waters of the Animas River that derive from State Engineer File No. 2801 or from rights decreed to it by the Echo Ditch Decree.

    - Also in May 2013, the State of New Mexico and the City of Bloomfield entered into an Agreement setting forth conditions for the review and acceptance of transfers to City municipal use of specific irrigation rights.

- In February 2013 the State Engineer and the State of New Mexico entered into agreements with the San Juan Water Commission (SJWC) and the La Plata Conservancy District (LPCD) for settlement of pending litigation and other disputes concerning water rights in which:

- Water appropriated pursuant to State Engineer File No. 2883 for the ALP that is not needed for the ALP as authorized and constructed under the Colorado Ute Settlement Act Amendments of 2000 was allocated to the SJWC, the LPCD, and the Navajo Nation based on previous ALP allocations to them that were not fully included in the ALP as now constructed, subject to the use of these additional allocations being administered as junior in priority to the ALP.
- The State Engineer agreed that return flow plans for quantifying return flow credits for the administration of diversions for municipal, industrial or domestic uses made pursuant to the ALP or the allocations under File No. 2883 will be based on measured return flows, including directly measured wastewater discharges to the San Juan or Animas rivers and indirectly measured return flows to these rivers calculated using a water budget method acceptable to the State Engineer. In September 2015 the State Engineer determined a specific method and standards for such return flow plans and determined that the same method and standards would also apply to certain other water rights held by the SJWC or its member entities.

- The USBR, in cooperation with the seven Colorado River basin states, completed the *Colorado River Basin Water Supply and Demand Study* in 2012. This study evaluated water supply and demand throughout the Colorado River basin—including possible increases in demands for Colorado River basin water in adjoining areas that use water exported from the basin—through the year 2060, reservoir system reliability for meeting water demands in the basin, and opportunities for system operations, demand reductions, and water supply augmentation projects to meet the projected gap in supply and demand. Other than the operation of Navajo Reservoir to meet the SJRBRIP's flow recommendations, the study did not evaluate water administration in the San Juan River Basin in New Mexico or potential shortages to meet water demands in New Mexico. The study also did not assess how deficiencies in deliveries from the Upper Basin to the Lower Basin at Lee Ferry under the Colorado River Compact, if any, might affect water uses in New Mexico.

- Substantive issues related to administration of interstate compacts need to be resolved, including:
  - Quantification of the Upper Basin's obligation to deliver water in the Colorado River at Lee Ferry for purposes of Mexican Treaty deliveries under Article III(c) of the Colorado River Compact, including determination of extraordinary drought.
  - Development of (1) the method for accounting consumptive uses in the Upper Basin pursuant to Article VI of the Upper Colorado River Basin Compact and (2) procedures for implementing any water use curtailments in the Upper Basin pursuant to Article IV of the Upper Colorado River Basin Compact.

- Resolution of New Mexico's issues with Colorado's performance in making water deliveries at the Colorado-New Mexico state line, as required by Article II.2 of the La Plata River Compact, during the summer and fall months after the snowmelt runoff period ends.
- Administration of ALP operations at the Durango Pumping Plant, including plant bypasses of project water for direct delivery to New Mexico, and at Lake Nighthorse consistent with the ALP Project Compact.

- The Northwestern New Mexico Rural Water Projects Act approved the San Juan Navajo Water Rights Settlement with certain deadlines to be substantially met in order for the settlement to become effective and with certain associated funding authorizations that will require congressional appropriations.
  - The United States must fund and complete rehabilitation of the Fruitland Irrigation Project by the end of 2016 and of the Hogback Irrigation Project by the end of 2019, at a total estimated cost of $23 million (indexed to 2004 dollars).
  - By the end of 2019, the United States must appropriate a total of $50 million to the Navajo Nation Water Resources Development Trust Fund and a total of $30 million (indexed to 2008 dollars) for conjunctive use groundwater wells in the San Juan River basin to supplement the surface water deliveries of the NGWSP to rural communities of the Navajo Nation.
  - Construction of all NGWSP facilities must be completed by the end of 2024, at a total estimated cost of $870 million (indexed to 2007 dollars).
- Due to the large amount of forested land within and upstream of the region, coupled with the recent drought conditions, the threat of wildfire and subsequent sedimentation impacts on streams and reservoirs remains a key planning issue. Continued and expanded efforts to reduce catastrophic fire risk through forest management, as well as additional information on the quantitative benefits of various management techniques, are needed. In particular, quantification of the effectiveness of riparian vegetation removal, upland conifer thinning, and other water salvage methods need further study to support well-informed decisions. Most of the forested land upstream from substantial storage reservoirs and water uses in New Mexico is in Colorado, and most of the usable streamflow in the San Juan River through New Mexico originates in Colorado.
- There is concern about the potential for hydraulic fracturing for oil and gas extraction to contaminate local water resources due to improperly managed surface or casing operations.
- There are several small rural drinking water systems within the region. These small systems face challenges in financing infrastructure maintenance and upgrades and

complying with water quality monitoring and training standards. The maintenance, upgrades, training, operation, and monitoring that is required to ensure delivery of water that meets drinking water quality standards is a financial and logistical challenge for these small systems.

- Water quality in the San Juan and Animas River continues to be a source of concern within the region. A recent study analyzed samples collected from four sites on the San Juan and Animas rivers in San Juan County and one at the Colorado-New Mexico border. Results from two years of data found human feces bacteria was the most common bacterium (SJSWCD et al., 2015).

- Sedimentation within the San Juan River basin continues to be a challenge for water suppliers. During rain and flood events, ephemeral tributaries such as Canon Largo may contribute substantial amounts of sediments into the rivers.

- In 2007 the USBR completed a *Hydrologic Determination of Water Availability from Navajo Reservoir and the Upper Colorado River Basin for Use in New Mexico* (USBR, 2007). The Hydrologic Determination was made for the purpose of contracting for water from the Navajo Reservoir water supply for the Navajo Nation's uses in New Mexico under the NGWSP as required by Section 11(a) of Public 87-483. Based on the Hydrologic Determination, depletions from the flow of the Colorado River at Lee Ferry by the Upper Basin states can be reasonably allowed to rise to an annual average of 5.76 million (M) acre-feet excluding evaporation from Colorado River Storage Project (CRSP) storage unit reservoirs other than Navajo Reservoir. As part of the Hydrologic Determination, New Mexico's Upper Basin allocation was determined to be at least 642,380 ac-ft/yr excluding the State's share of reservoir evaporation from CRSP storage unit reservoirs (Lake Powell, Flaming Gorge Reservoir, and the Aspinall Unit). In 2006 the Upper Colorado River Commission (UCRC) approved a resolution stating that while it disagrees with some of the assumptions contained in a draft of the Hydrologic Determination, the UCRC does not object to a finding that the yield available for development by the Upper Basin is at least 5.76M ac-ft/yr, excluding reservoir evaporation at Lake Powell, Flaming Gorge Reservoir, and the Aspinall Unit reservoirs of the CRSP (UCRC, 2006).

5.1 Summary of Climate Conditions

The 2003 RWP (SJWC, 2003) included an analysis of historical temperature and precipitation in the region. This section provides an updated summary of temperature, precipitation, snowpack conditions, and drought indices pertinent to the region (Section 5.1.1). Studies relevant to climate change and its potential impacts to water resources in New Mexico and the San Juan Basin 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 the San Juan Basin region in San Juan, Rio Arriba, and McKinley counties, and it identifies two stations (Dulce and Otis) that were used for analysis of weather trends in the region. These two stations were selected based on location, how well they represented conditions in their respective counties, and completeness of their historical records. In addition to the climate stations, data available from two snow course or snowpack telemetry (SNOTEL) stations were used to document snowfall in the Chuska Mountains in the southwestern part of the region (Table 5-1). The locations of the climate stations for which additional data were analyzed are shown in Figure 5-1.

Long-term minimum, maximum, and average temperatures for the Dulce and Otis weather stations are detailed in Table 5-2, and average summer and winter temperatures for each station for each year of record are shown on Figure 5-2.

The average precipitation distribution across the entire region is shown on Figure 5-3, and Table 5-2 lists the minimum, maximum, and long-term average annual precipitation (rainfall and snowfall) at Dulce and Otis. The long-term averages do not reflect the considerable variability of precipitation, which creates a direct challenge for water supply planning. The variability in total annual precipitation for the two selected climate stations is shown in Figure 5-4 and is also reflected in the snow data and drought indices discussed below. Monthly variability in precipitation and resulting streamflow also may affect the availability of water at times when water is most needed for agriculture or other uses.

The Natural Resources Conservation Service (NRCS) operates two snow course stations in the planning region (in the Chuska Mountains in southwestern San Juan County [Figure 5-1]), at which snow depth and snow water equivalent data have been collected (Figure5-5) (NRCS, 2014a).

- Hidden Valley snow course station
- Missionary Spring snow course station

The snow water equivalent is the amount of water, reported in inches, within the snowpack, or the amount of water that would result if the snowpack were instantly melted (NRCS, 2014b). The end of season snowpack is a good indicator of the runoff that will be available to meet water supply needs. A summary of the early April (generally measured within a week of April 1) snow depth and snow water equivalent information at the two stations is provided on Figure 5-5. The snowpack at these two stations is an indicator only of the runoff that might be available to meet water supply needs on the Navajo Reservation that are supplied from runoff in the Chuska Mountains. It is not an indicator of runoff from the San Juan Mountains in Colorado into the San Juan, Animas, or La Plata rivers.

Table 5-1. San Juan Basin Climate Stations

Page 1 of 2

Climate Stations [a]	Latitude	Longitude	Elevation	Precipitation		Temperature	
				Data Start	Data End	Data Start	Data End
San Juan County							
Aztec Ruins NM	36.84	–108.00	5,644	1/1/1895	Present	1/1/1895	Present
Bloomfield 3 SE	36.67	–107.96	5,806	12/1/1892	Present	12/1/1892	Present
Chaco Canyon Natl Mon	36.03	–107.91	6,174	12/1/1909	Present	8/1/1912	Present
Farmington 3 NE	36.75	–108.17	5,404	2/1/1914	3/31/1978	7/1/1914	3/31/1978
Farmington Ag Science Ctr	36.69	–108.31	5,625	5/1/1978	Present	5/1/1978	Present
Farmington FAA Airport	36.75	–108.23	5,535	10/1/1941	Present	10/1/1941	Present
Fruitland 2 E	36.73	–108.37	5,145	1/1/1893	4/30/2010	1/1/1893	4/30/2010
Navajo Dam	36.80	–107.62	5,770	6/1/1963	Present	6/1/1963	Present
Navajo Reservoir	36.81	–107.61	5,775	—	—	—	—
Newcomb	36.30	–108.72	5,584	6/1/1948	4/30/1971	6/1/1948	3/31/1971
Otis	36.33	–107.84	6,880	11/1/1905	Present	4/1/1957	Present
Shiprock	36.80	–108.69	4,972	7/1/1926	10/31/2007	8/1/1926	10/31/2007
Rio Arriba County							
Dulce	36.94	–107.00	6,793	5/1/1906	Present	5/1/1906	Present
Governador	36.68	–107.37	7,205	7/1/1925	4/30/1951	7/1/1925	4/30/1951
Lindrith 2 SE / Lindrith 1 WSW, NM	36.28	–107.03	7,360	8/1/1971	Present	8/1/1971	Present
Lybrook	36.23	–107.55	7,150	6/1/1951	3/31/2011	6/1/1951	7/31/2011
Rosa (Near)	36.98	–107.42	6,200	12/1/1894	12/31/1931	—	—
McKinley County							
Crownpoint	35.68	–108.15	6,965	7/1/1914	10/31/1969	7/1/1914	10/31/1969
Mexican Springs	35.80	–108.83	6,444	5/1/1934	3/31/1972	5/1/1934	8/31/1947
Pitt Ranch	35.80	–108.02	6,463	11/1/1942	3/31/1968	—	—

Source: WRCC, 2014

— = Information not available

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

NR = Temperature is not recorded at SNOTEL stations.

Table 5-1. San Juan Basin Climate Stations

Climate Stations [a]	Latitude	Longitude	Elevation	Precipitation		Temperature	
				Data Start	Data End	Data Start	Data End
McKinley County (cont.)							
Star Lake	35.92	–107.47	6,635	1/1/1922	6/30/2008	1/1/1922	6/30/2008
Tohatchi 1 ESE	35.85	–108.73	6,424	7/1/1909	7/31/1932	8/1/1911	7/31/1932
Tohatchi 6 NE	35.90	–108.65	5,990	5/1/1979	5/31/1992	5/1/1979	5/31/1992
SNOTEL Stations							
Hidden Valley – Snow	36.27	–109.00	8,480	1988	Present	NR	NR
Missionary Spring – Snow	36.10	–108.83	7,940	1991	Present	NR	NR

Source: WRCC, 2014

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

— = Information not available

NR = Temperature is not recorded at SNOTEL stations.

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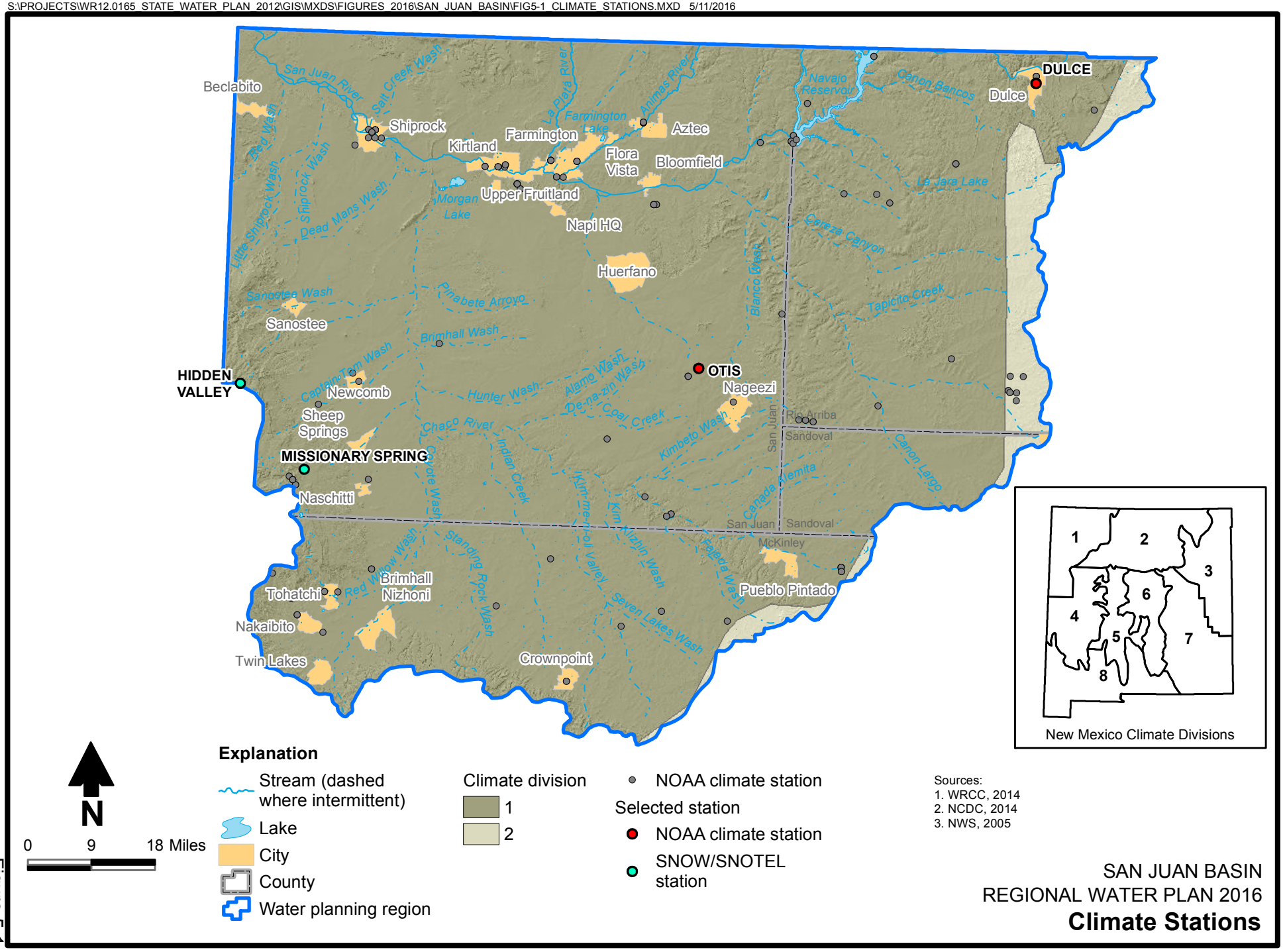
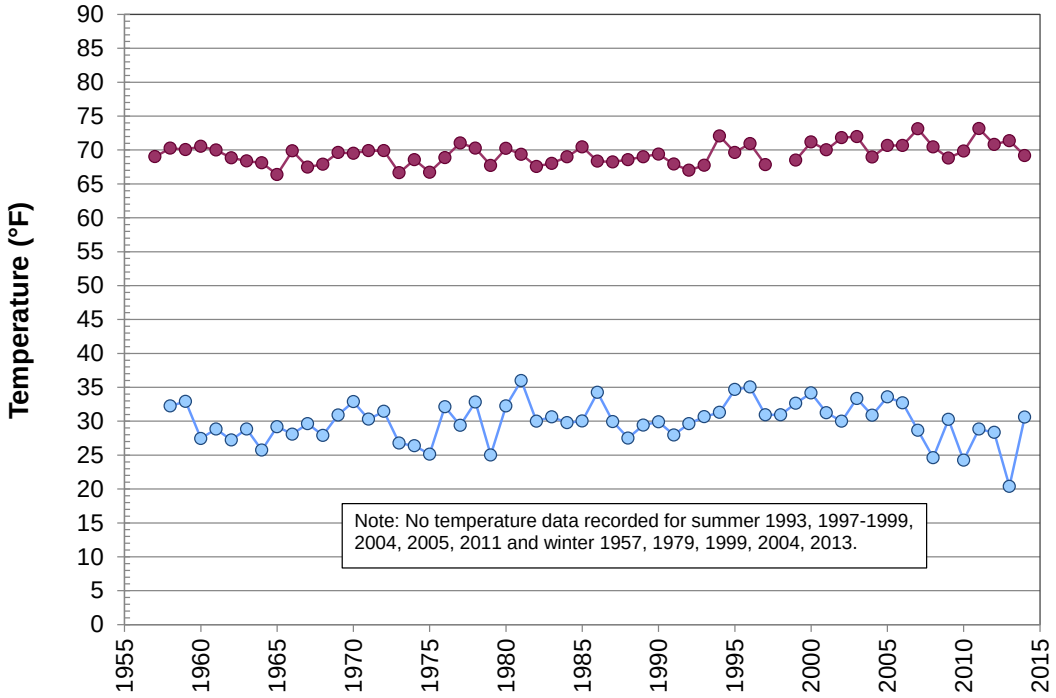
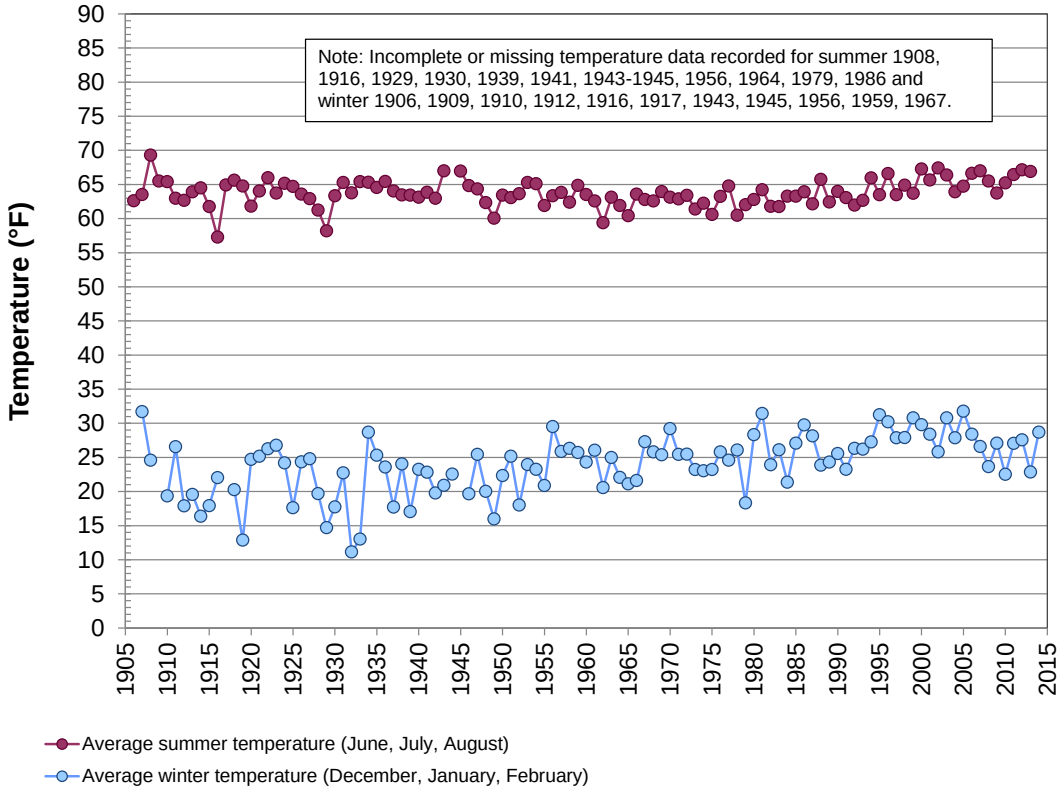


Figure 5-1

Otis



Dulce



SAN JUAN BASIN
REGIONAL WATER PLAN 2016

Average Temperature
Otis and Dulce Climate Stations

Figure 5-2

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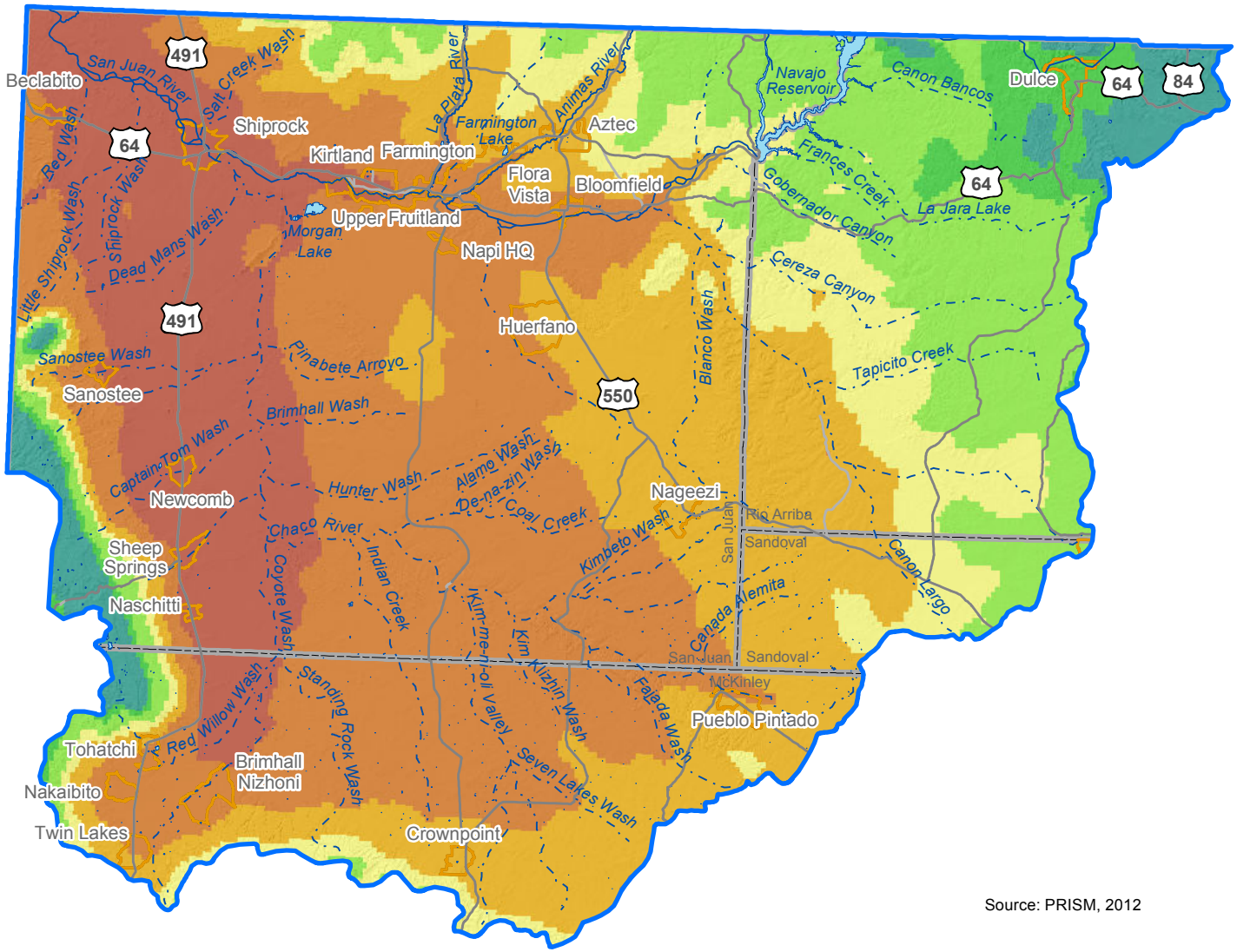


Source: PRISM, 2012

N

0 9 18 Miles

Explanation

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

Normal annual precipitation (in/yr)

- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 14
- 14 - 18
- 18 - 20
- 20 - 29

SAN JUAN BASIN
REGIONAL WATER PLAN 2016

Average Annual Precipitation (1980 to 2010)

Figure 5-3

Table 5-2. Temperature and Precipitation for Selected Climate Stations San Juan Basin Water Planning Region

Station Name	Precipitation (inches)				Temperature			
					Average (°F)			
	Average Annual [a]	Minimum [b]	Maximum [b]	% of Possible Observations [c]	Annual [d]	Minimum [e]	Maximum [e]	% of Possible Observations [c]
Otis	10.46	5.32	16.23	48.4	49.4	36.9	62	48.4
Dulce	17.50	8.03	30.73	92.6	44.3	25.8	62.8	90.4

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.

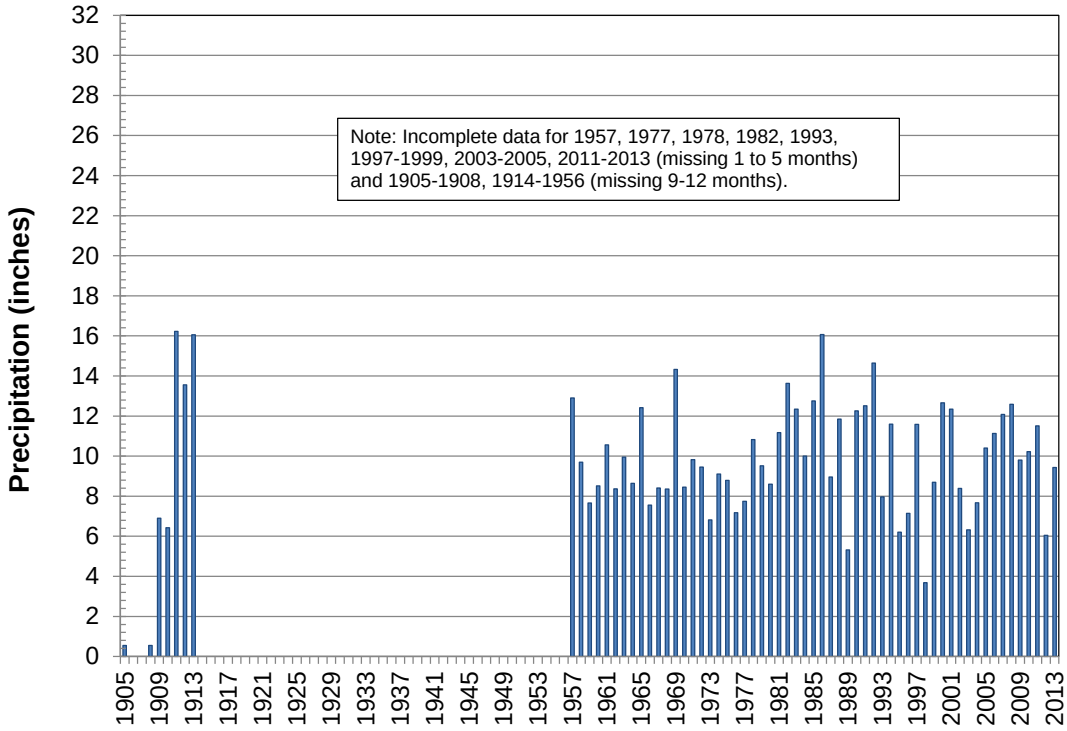
[b] Minimum and maximum recorded annual precipitation amounts for each station.

[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).

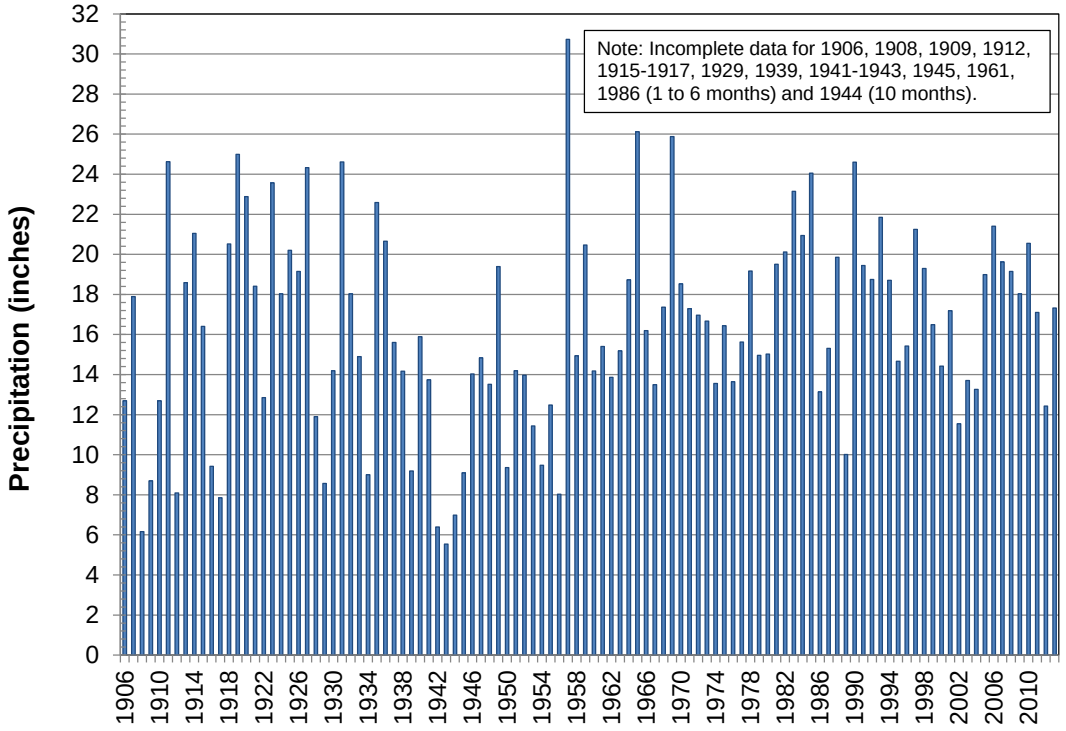
[d] Average of the daily average temperatures calculated for each station.

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

Otis



Dulce



SAN JUAN BASIN
REGIONAL WATER PLAN 2016

Annual Precipitation
Otis and Dulce Climate Stations

Figure 5-4

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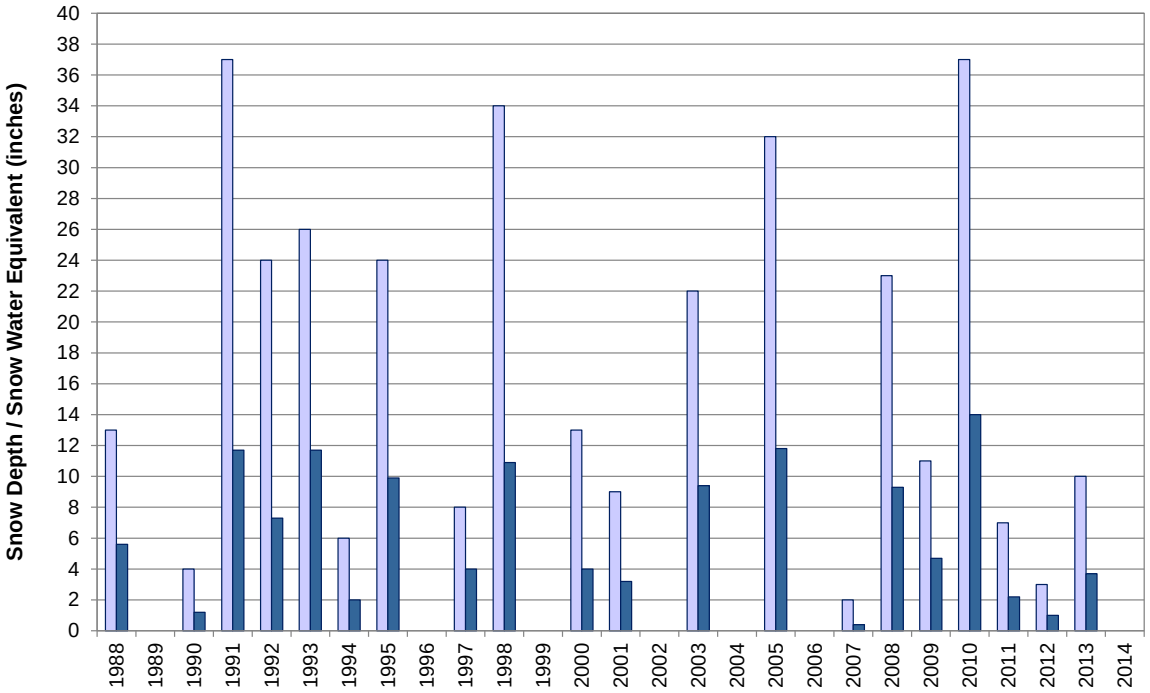
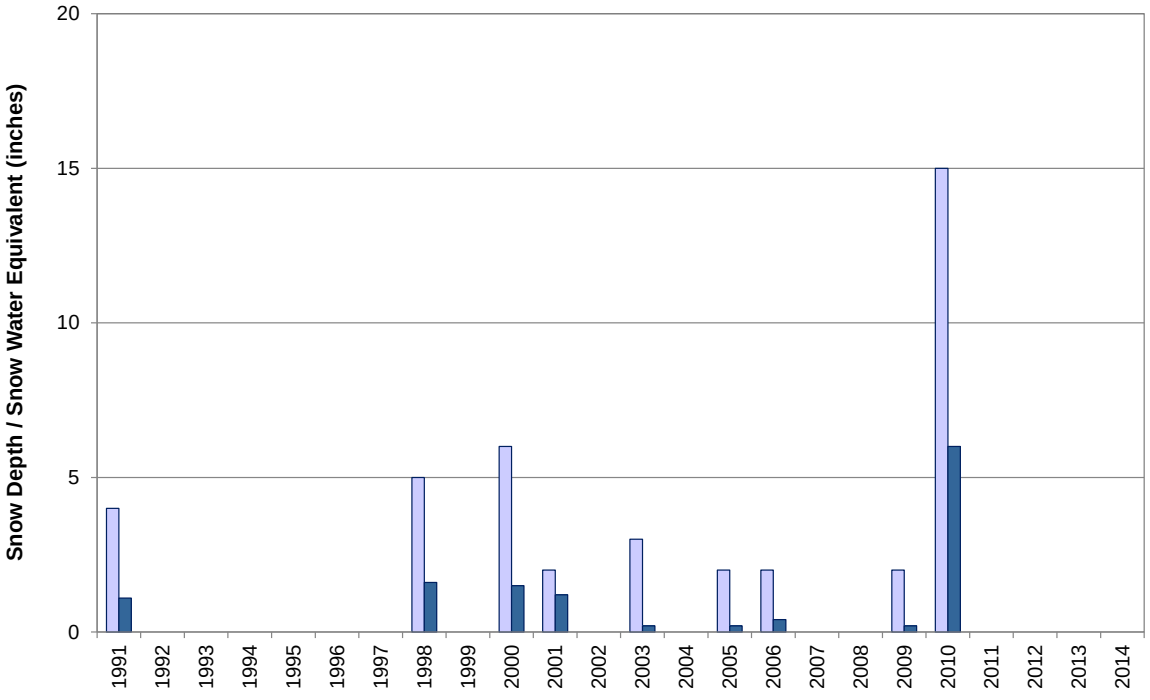
Hidden Valley Snow Course with Aerial Marker



Missionary Spring Snow Course with Aerial Marker



Snow depth

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

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

SAN JUAN BASIN
REGIONAL WATER PLAN 2016

Snow Depth and Snow Water Equivalent for April

Figure 5-5

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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.

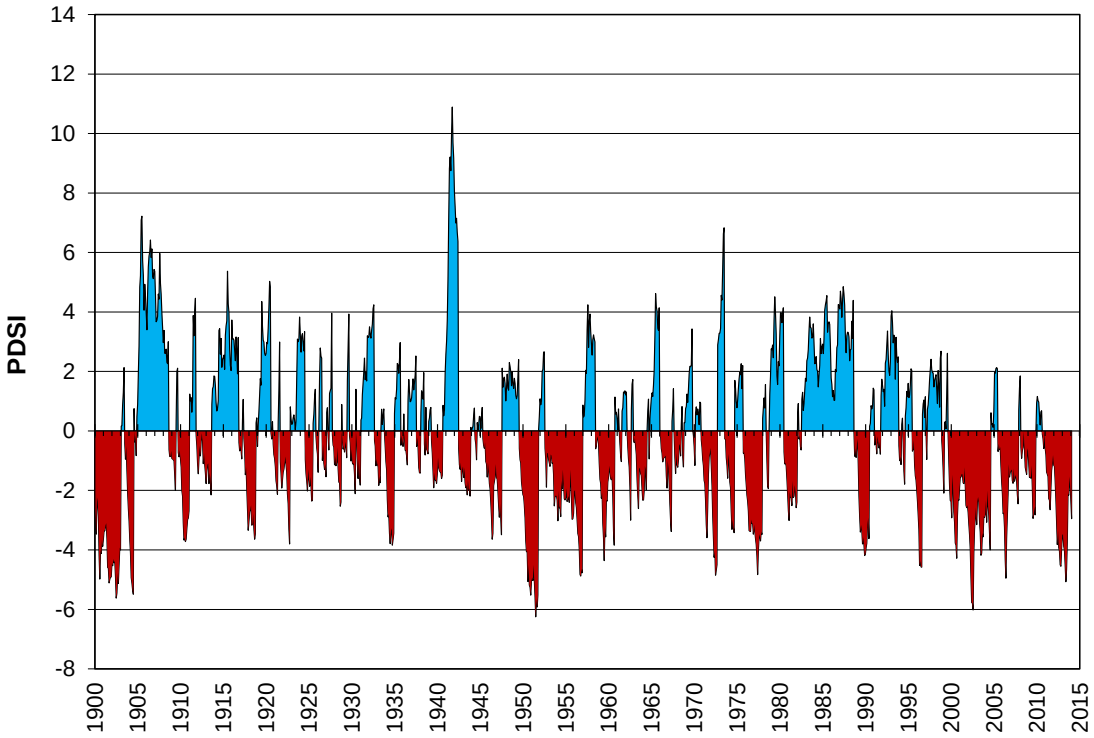
Table 5-3. Palmer Drought Severity Index Classifications

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

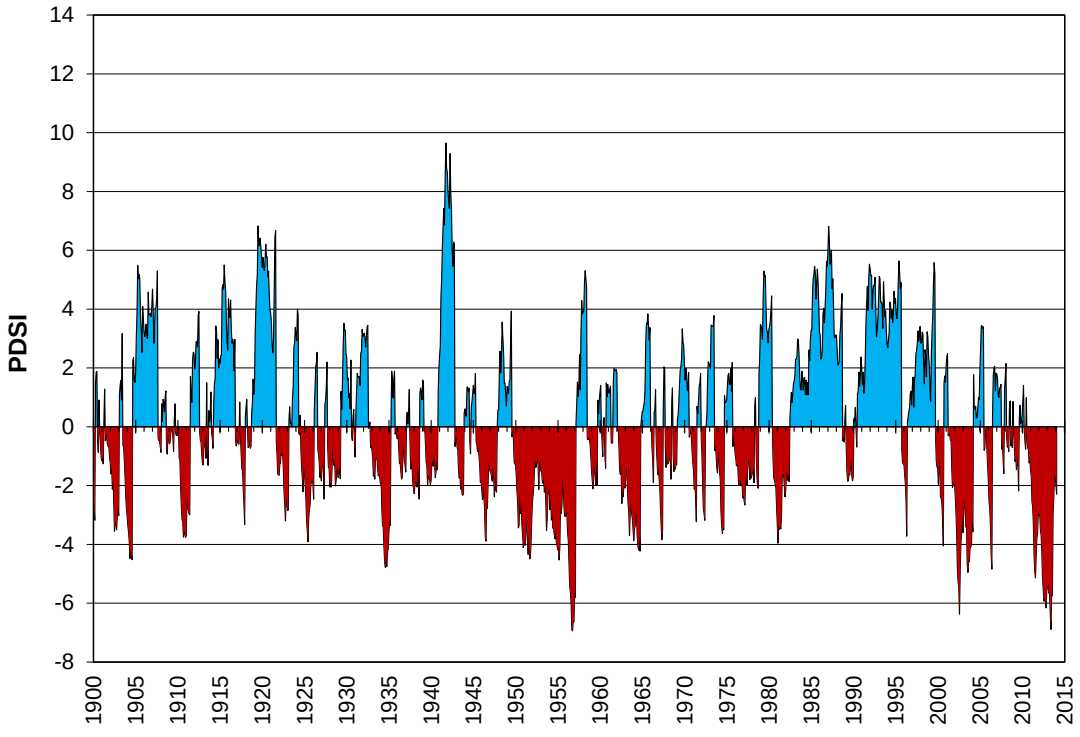
There are considerable limitations when using the PDSI, as it may not describe rainfall and runoff that varies from location to location within a climate division and may also lag in indicating emerging droughts by several months. Also, the PDSI does not consider groundwater or reservoir storage, which 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. All four counties in the planning region fall primarily within New Mexico Climate Division 1 (the Northwestern Plateau Climate Division); small portions of the southeastern and eastern edges of the region, in McKinley, Sandoval, and Rio Arriba counties, fall within Division 2 (the Northern Mountains Climate Division) (Figure 5-1). Figure 5-6 shows the long-term PDSI for these two regions. Of interest are the large variations from year to year in both divisions, which are similar in pattern though not necessarily in magnitude.

Climate Division 1



Climate Division 2



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

SAN JUAN BASIN
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Palmer Drought Severity Index
New Mexico Climate Divisions 1 and 2

Figure 5-6

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

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

- *El Niño/La Niña:* El Niño and La Niña are characterized by a periodic warming and cooling, respectively, of sea surface temperatures across the central and east-central equatorial Pacific. Years in which El Niño is present are more likely to be wetter than average in New Mexico, and years with La Niña conditions are more likely to be drier than average, particularly during the cool seasons of winter and spring. This is not the case for Colorado as there is little to no correlation between a strong El Niño and above average snowpack in the Upper Animas, San Juan, or La Plata basins, which head in the San Juan Mountains of southwest Colorado.

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

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

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

moisture source. This combination causes a distinct rainy season over large portions of western North America (NWS, 2015).

5.1.2 Recent Climate Studies

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

The Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) that was 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 markedly in recent decades. Since the 1950s, the region has been hotter than any comparably long period in at least 600 years. Temperatures 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. 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 "given poor representation of the North American monsoon processes in most climate models" (NMOSE/NMISC, 2006).

Recent studies in Colorado indicate that warmer temperatures are expected to increase sublimation from snowpack and increase evapotranspiration (Lukas et al., 2014). In the San Juan Basin planning region streamflow is expected to decrease as a result, though there is considerable variability in modeled predictions.

Based on these studies, the effects of climate change that are likely to occur in 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 due to a combination of diminished cold season snowpack in headwaters regions and higher evapotranspiration in the warm season (e.g., Christensen et al., 2004; Hurd and Coonrod, 2008; USBR, 2011, 2013). The seasonal distribution of streamflow is projected to change as well: flows could be somewhat higher than at present in late winter, but peak runoff will occur earlier and be diminished. Late spring/early summer flows are projected to be much lower than at present, given the combined effects of less snow, earlier melting, and higher evaporation rates after snowmelt.
- Forest habitat is vulnerable to both decreases in cold-season precipitation and increases in warm-season vapor pressure deficit (Williams et al., 2010). Stress from either of these factors leave forests increasingly susceptible to insects, forest fires, and desiccation. Warmer temperatures increase insect survivability and fire risk.

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

5.2 Surface Water Resources

Surface water supplies approximately 99 percent of the water currently diverted in the San Juan Basin Water Planning Region, with its primary uses being for irrigated agriculture, power, and

public water supply. Most of the drinking water in the region comes from surface water. The Cities of Farmington and Aztec and several other domestic water providers divert water from the Animas River. The City of Bloomfield and other domestic water providers divert water from the San Juan River. The Navajo Tribal Utility Authority (NTUA) may divert water for municipal and domestic purposes from the San Juan River near Shiprock or from the Animas River through the City of Farmington's water diversion, treatment, and distribution system to which Navajo Nation pipelines are connected.

The dominant waterways and tributaries flowing in the region are the San Juan River and its tributaries the Animas River, Canon Largo, Chaco River, and La Plata River. 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 necessarily represent available supply, as water storage in Navajo Reservoir and other reservoirs has been developed to allow water demands under relatively junior water rights to be met during periods of extreme low flows in the San Juan and Animas rivers. The available water supply discussed in Section 5.5 is intended to represent supply considering both physical and legal limitations. The information provided in this section is intended to illustrate the variability and magnitude of streamflow, and particularly the relative magnitude of streamflow in recent years.

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

For this water planning update, five stream gages, shown on Figure 5-7, were analyzed in more detail. These stations were chosen because of their locations in the hydrologic system, completeness of record, and representativeness as key sources of supply. Figure 5-8 shows the minimum and median annual water yield for these gages. Figures 5-9a through 5-9c show the annual water yield from the beginning of the period of record through 2013 for the five 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. Figures 5-9a through 5-9c illustrate that streamflow in most years since 2000 has been below average.

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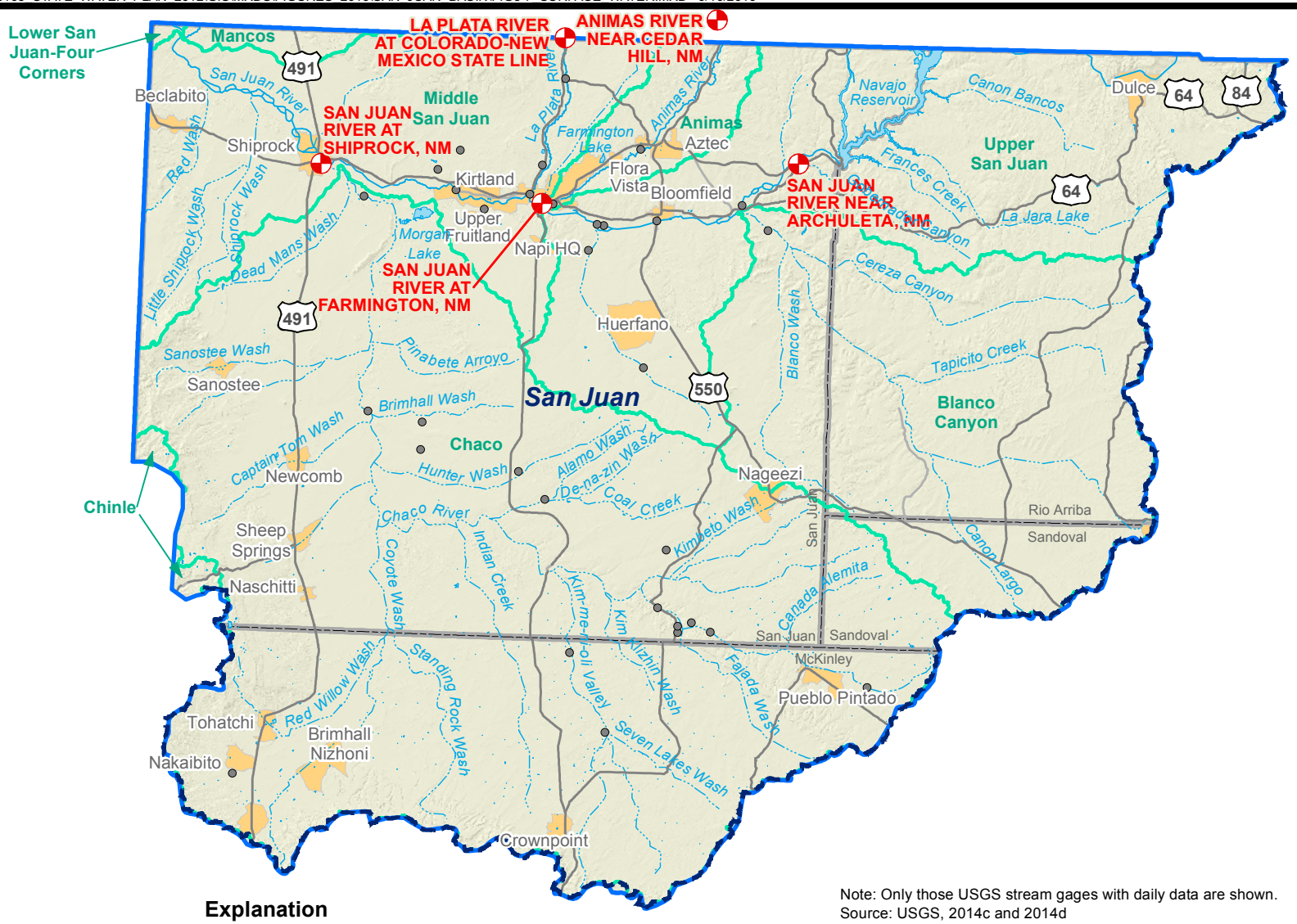

Figure 5-7

SAN JUAN BASIN
REGIONAL WATER PLAN 2016

Major Surface Drainages, Stream Gages, Reservoirs, and Lakes

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 Juan County								
San Juan River Near Archuleta, NM	09355500	36.8018889	–107.698639	5,653	3,260	47,000	12/1/1954	Present
San Juan R Nr Blanco, NM	09356500	36.7297167	–107.81195	5,540	3,560	—	10/1/1930	12/31/1954
Canon Largo Nr Blanco, NM	09356565	36.6894833	–107.756969		1,700	—	10/1/1977	10/9/1981
San Juan River at Bloomfield, NM	09357000	36.7000056	–107.986734	5,405	5,410	—	10/1/1955	12/31/1963
San Juan River at Hammond Br Nr Bloomfield, NM	09357100	36.6894491	–108.095626	—	—	—	10/1/1977	10/9/1981
Gallegos Canyon at NIIP Nr Carson Trading Post, NM	09357245	36.4556	–108.0048	—	—	—	9/1/1993	9/30/1994
Gallegos Canyon Nr Farmington, NM	09357250	36.6477827	–108.125627	—	—	—	10/1/1977	9/30/1981
Gallegos Canyon at NIIP Near Farmington, NM	09357255	36.6908378	–108.109515	—	—	—	9/3/1993	10/27/1994
Animas River Near Ceadar Hill, NM [d]	09363500	37.0365694	–106.124667	5,960	1,090	20,000	11/1/1933	Present
Animas River Below Aztec, NM	09364010	36.8178611	–108.024444	5,560	1,301	28,000	12/17/2002	Present
Animas River at Farmington, NM	09364500	36.7225	–108.20175	5,280	1,360	30,000	10/1/1913	Present
San Juan River at Farmington, NM	09365000	36.7230167	–108.225589	5,230	7,240	86,000 [e]	10/1/1930	Present
La Plata River at Colorado-New Mexico State Line [d]	09364500	36.999722	–107.81194	5,972	331	15,000	10/1/1920	Present
La Plata River at La Plata, NM	09367000	36.9309167	–108.184639	5,736	351	NA	12/17/2002	Present
La Plata River Trib Nr Farmington, NM	09367400	36.7861111	–108.226	5,375	1	24,000	10/1/1979	9/30/1983
La Plata River Near Farmington, NM	09367500	36.737575	–108.250336	5,215	583	—	3/1/1938	Present
Ojo Amarillo Canyon at NIIP Nr Fruitland, NM	09367536	36.7102972	–108.343411	—	—	—	9/2/1993	10/25/1994
San Juan R Nr Fruitland, NM	09367540	36.7402792	–108.403135	—	—	—	10/1/1977	9/30/1980

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: San Juan Water Commission, 2003; USGS, 2014a

[d] USGS lists this gage as being in La Plata County, Colorado.

[e] 4,000 acres are irrigated by Farmers Mutual Ditch, which bypasses this gage.

USGS = U.S. Geological Survey

ft amsl = Feet above mean sea level

sq mi = Square miles

NA = Not available

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

Table 5-4a. USGS Stream Gage Stations

USGS Station [a]							Period of Record	
Name [b]	Number	Latitude	Longitude	Elevation (ft amsl)	Drainage Area (sq mi)	Irrigated Upstream Land [c] (acres)	Start Date	End Date
San Juan County (cont.)								
Shumway Arroyo Near Fruitland, NM	09367555	36.8066139	–108.396753	—	63	—	1/1/1975	9/30/1982
Shumway Arroyo Near Waterflow, NM	**09367561**	**36.7733341**	**–108.441193**	**5,140**	**74**	**—**	**9/12/1974**	**5/9/1990**
Chaco Wash at Eb at Chaco Canyon Natl Mon, NM	09367676	36.0200164	–107.851726	—	—	—	3/26/1980	12/28/1982
Fajada Wash at Chaco Canyon Natl Mon, NM	09367678	36.0175163	–107.918395	—	—	—	3/28/1980	9/30/1983
Chaco Wash at Chaco Canyon National Monument, NM	09367680	36.0283722	–107.918981	—	578	NA	4/8/1976	5/10/1990
Gallo Wash at Chaco National Monument, NM	09367682	36.035016	–107.890894	—	—	—	9/30/1977	10/21/1981
Chaco Wash Nr Pb at Bridge at Chaco Natl Mon, NM	09367683	36.0579083	–107.961214	—	—	—	3/27/1980	9/30/1983
Ah-Shi-Sle-Pah Wash Near Kimbeto, NM	09367685	36.1538528	–107.946506	6,180	8	—	3/18/1977	11/28/1984
De-Na-Zin Wash Nr Bisti Trading Post, NM	09367710	36.2317889	–108.198583	—	183	—	1/1/1976	9/30/1982
Hunter Wash at Bisti Trading Post, NM	09367930	36.2764889	–108.254758	5,770	46	—	3/20/1975	9/30/1982
Teec-Ni-Di-Tso Wash Nr Burnham, NM	09367934	36.3072291	–108.456747	—	8	—	10/1/1977	10/14/1982
Burnham Wash Nr Burnham, NM	09367936	36.3530618	–108.45508	—	9	—	10/1/1977	10/14/1982
Chaco River Nr Burnham, NM	09367938	36.3681361	–108.567178	—	3,697	—	10/1/1977	10/14/1982
Chaco River Near Waterflow , NM	09367950	36.7244449	–108.591474	4,980	4,350	—	11/1/1975	10/11/1994
San Juan River at Shiprock, NM	09368000	36.7766667	–108.683056	4,890	12,900	118,000	10/1/1934	Present
McKinley County								
Chaco Wash Nr Starlake Trading Post, NM	09367660	35.9352964	–107.528106	—	59	—	10/1/1977	10/20/1982
Kim-Me-Ni-Oli Wash Nr Crownpoint, NM	09367687	35.8486296	–108.060621	6,300	228	—	10/1/1981	9/30/1983
Kim-Me-Ni-Oli Wash Nr Lake Valley, NM	09367689	35.9791823	–108.138124	6,060	400	—	9/21/1981	9/30/1983
Black Springs Wash Nr Mexican Springs, NM	09367900	35.7591667	–108.816389	6,280	7	NA	4/12/1979	10/19/1982

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: San Juan Water Commission, 2003; USGS, 2014a

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 Juan County				
San Juan River Near Archuleta, NM	231,887	662,502	1,843,220	50
San Juan R Nr Blanco, NM	323,613	804,689	2,636,688	24
Animas River Near Ceadar Hill, NM [d]	195,399	624,711	1,413,183	79
Animas River Below Aztec, NM	289,008	513,980	907,855	10
Animas River at Farmington, NM	134,947	559,337	1,421,871	87
San Juan River at Farmington, NM	521,184	1,299,883	4,167,878	82
La Plata River at Colorado-New Mexico State Line [d]	2,860	18,570	92,451	92
La Plata River at La Plata, NM	504	4,601	29,321	10
La Plata River Near Farmington, NM	350	8,543	136,902	71
Chaco River Near Waterflow , NM	14,479	29,755	77,682	18
San Juan River at Shiprock, NM	452,841	1,282,507	4,411,131	78

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

[c] USGS lists this gage as being in La Plata County, Colorado.

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 Juan County													
San Juan River Near Archuleta, NM	50	54,822	51,273	62,607	71,336	103,440	107,508	67,407	57,180	52,792	48,393	45,864	52,408
San Juan R Nr Blanco, NM	24	16,805	22,146	58,950	178,576	263,766	231,158	77,873	37,902	33,773	38,483	20,219	16,447
Animas River Near Ceadar Hill, NM [d]	79	15,264	14,541	26,624	63,650	153,241	169,067	73,086	38,094	31,693	29,238	20,437	16,681
Animas River Below Aztec, NM	10	16,921	16,278	27,949	54,584	134,355	110,650	37,316	21,978	23,683	28,682	19,814	18,119
Animas River at Farmington, NM	87	17,052	16,567	27,839	57,548	144,731	167,069	64,506	30,144	26,265	26,895	21,070	18,324
San Juan River at Farmington, NM	82	59,900	61,303	92,626	163,576	291,894	302,362	126,251	77,937	69,092	72,024	58,191	58,801
La Plata River at Colorado-New Mexico State Line [d]	92	696	907	2,158	5,822	6,339	3,737	1,139	697	653	794	663	697
La Plata River at La Plata, NM	10	505	664	1,215	2,025	1,085	381	139	65	290	197	229	304
La Plata River Near Farmington, NM	71	1,031	1,244	2,021	4,543	3,490	1,743	504	653	635	1,101	704	808
Chaco River Near Waterflow, NM	18	2,127	3,874	1,830	1,591	1,999	1,273	3,399	6,649	3,700	2,371	3,482	1,315
San Juan River at Shiprock, NM	78	62,965	64,926	95,287	162,217	282,540	295,382	123,188	78,720	70,905	74,712	62,750	62,464

Source: USGS, 2014c

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

USGS = U.S. Geological Survey

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

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

[d] USGS lists this gage as being in La Plata County, Colorado.

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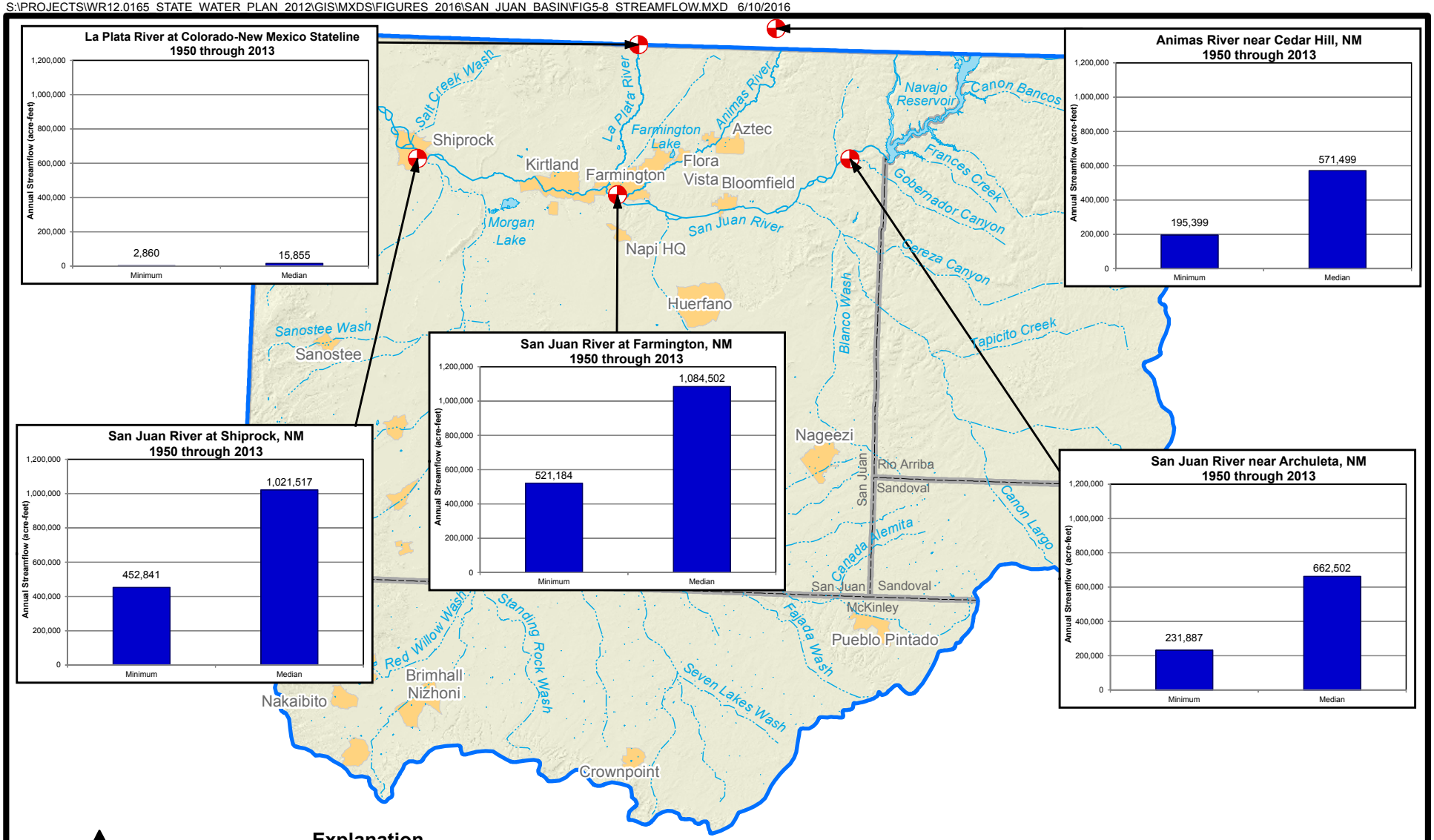


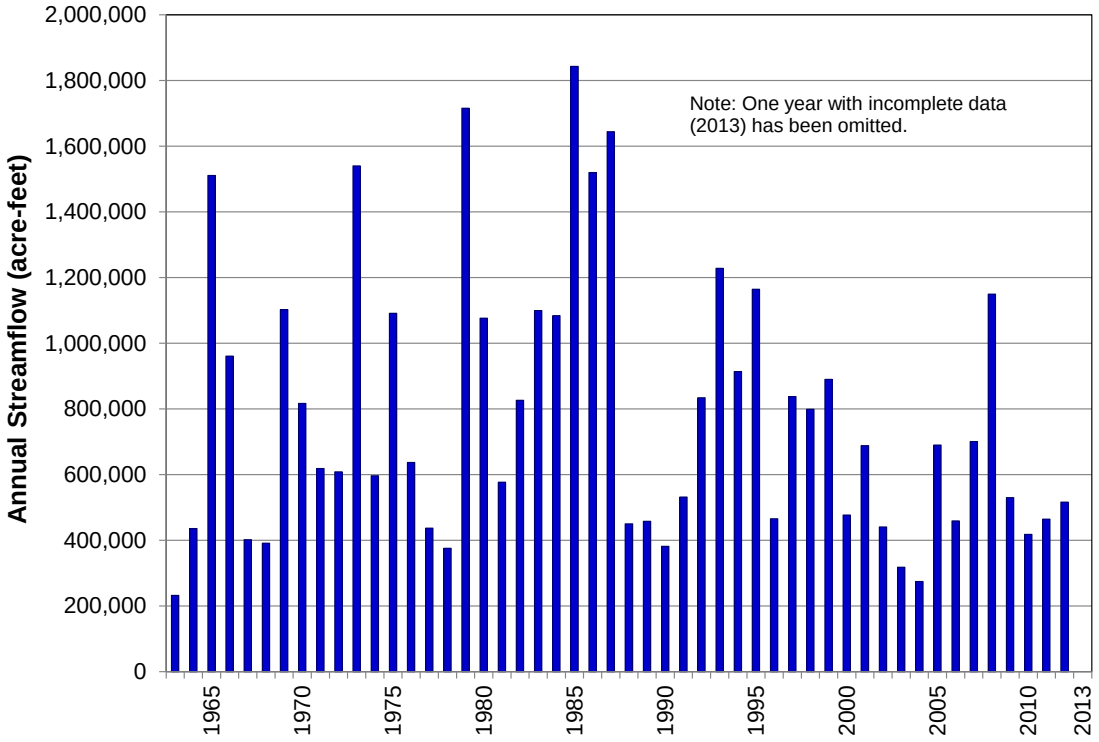
Notes:
1. Years with incomplete data were not included in the analysis.
2. Source is USGS, 2014c.

Figure 5-8

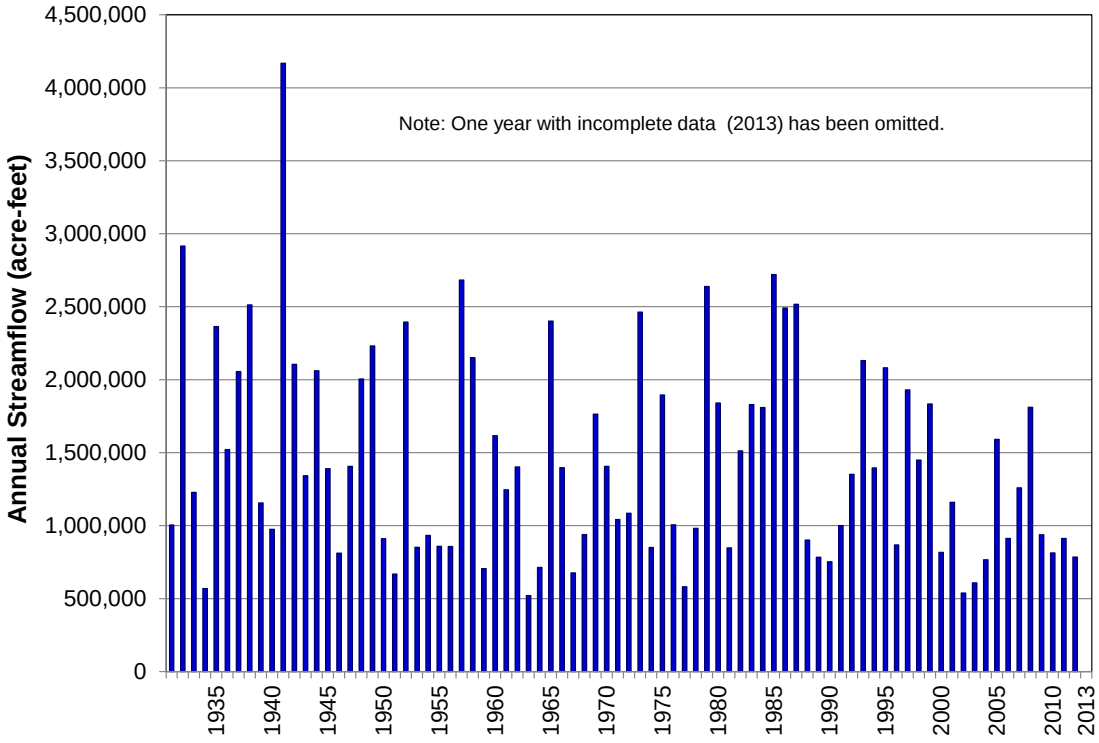
SAN JUAN BASIN
REGIONAL WATER PLAN 2016

Minimum and Median Yield, 1950 through 2013

San Juan River near Archuleta, NM



San Juan River at Farmington, NM



SAN JUAN BASIN
REGIONAL WATER PLAN 2016

Annual Streamflow for Selected Gaging Stations on the San Juan River

Figure 5-9a

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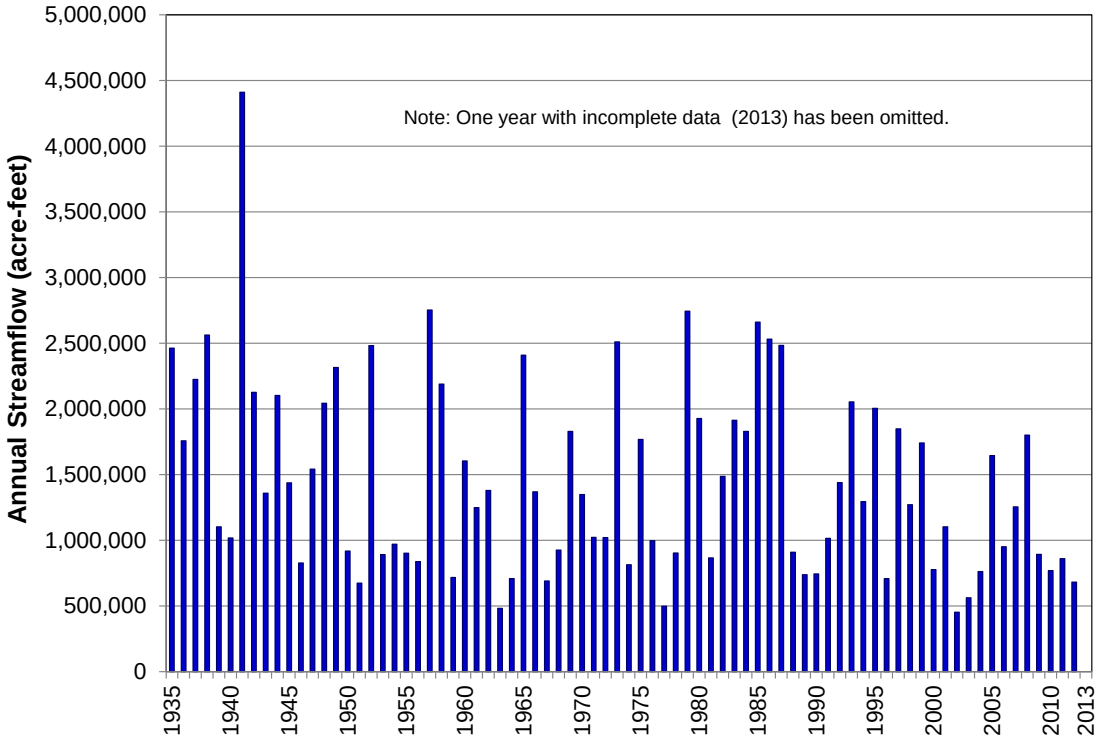
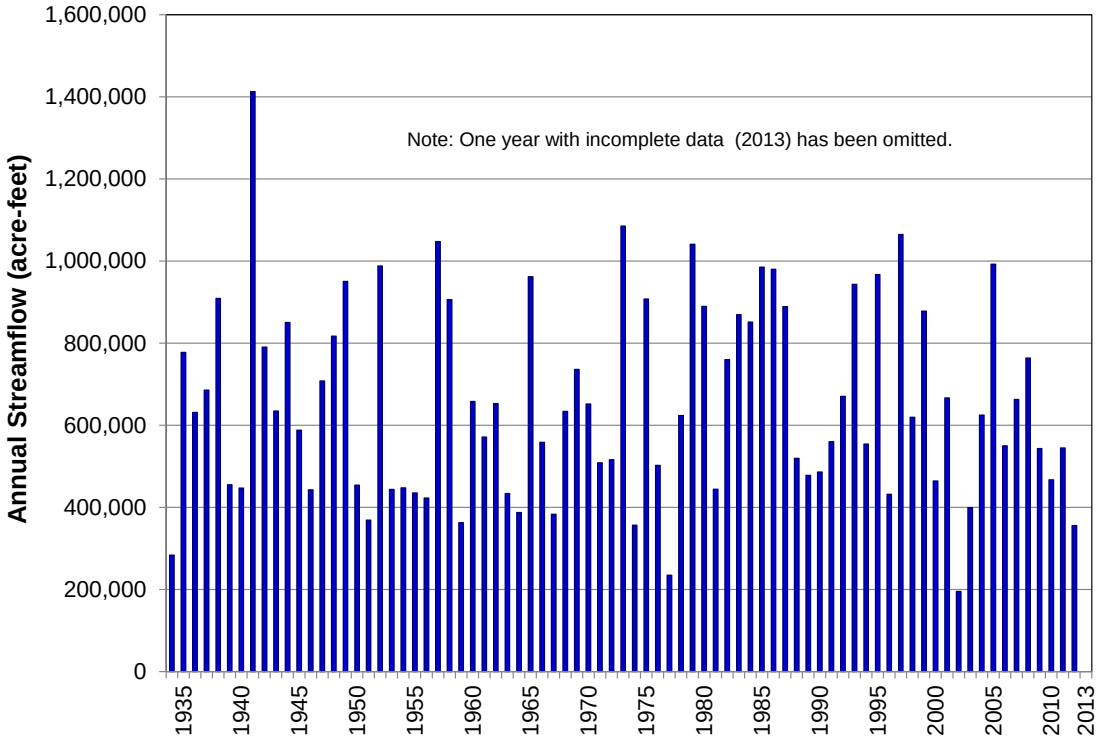
San Juan River at Shiprock, NM



Animas River near Cedar Hill, NM



SAN JUAN BASIN
REGIONAL WATER PLAN 2016

Annual Streamflow for Selected Gaging Stations on the San Juan and Animas Rivers

Figure 5-9b

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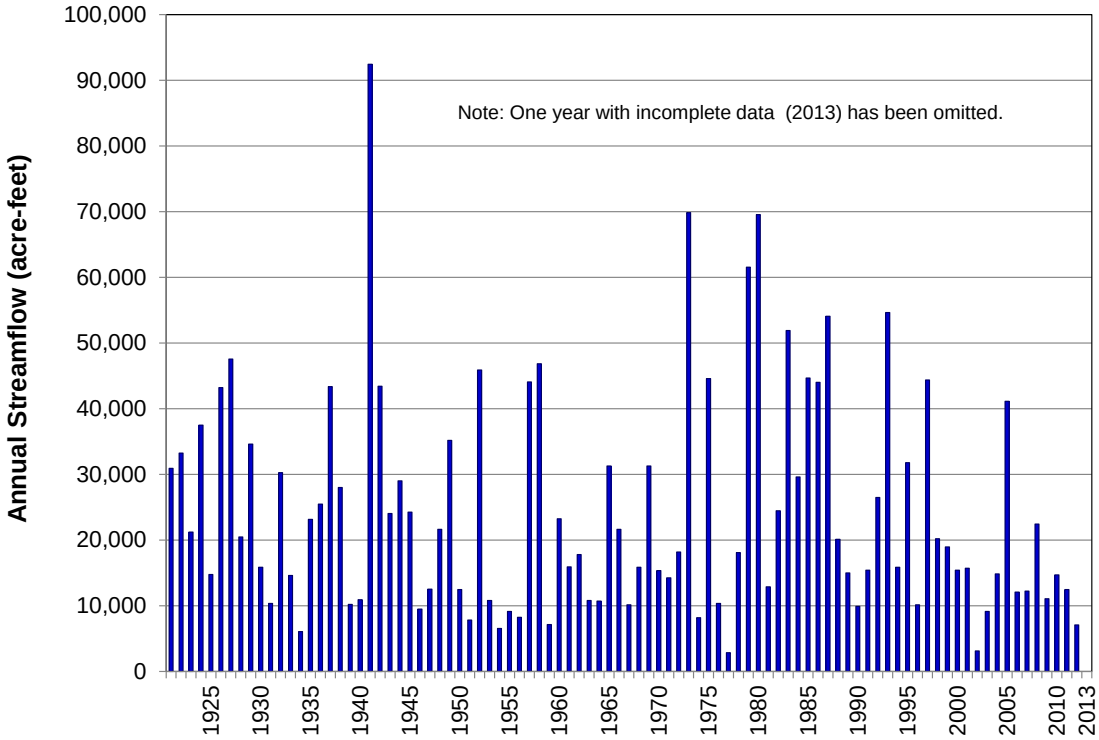
La Plata River at Colorado-New Mexico Stateline



SAN JUAN BASIN
REGIONAL WATER PLAN 2016

Annual Streamflow for Selected Gaging Station on the La Plata River

Figure 5-9c

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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, Navajo Reservoir on the San Juan River, constructed in 1963, is operated by the USBR and is the main storage facility for surface water in the area, with a capacity of 1.7M acre-feet. The Navajo Reservoir water supply is contracted for uses by the Navajo Nation under the Navajo Indian Irrigation Project (NIIP) and the NGWSP, and for uses by the Jicarilla Apache Nation, which include Jicarilla uses under the NGWSP in addition to currently subcontracted uses for the Public Service Company of New Mexico (PNM) at the San Juan Generating Station (SJGS) and the City of Gallup under the NGWSP.

- Morgan Lake, with a capacity of about 42,800 acre-feet, is filled by diversions from the San Juan River and is operated by the Arizona Public Service Company (APSCo) to store water for use in the generation of thermal electric power at the Four Corners Power Plant (FCPP).

- Farmington Lake, with a capacity of under 6,900 acre-feet, is filled by diversions from the Animas River and is the principal water storage facility of the City of Farmington.

In addition, Lake Nighthorse in Colorado is the ALP storage facility from which ALP diversion demands in New Mexico can be met when the available natural flow in the Animas River is not sufficient to meet these demands.

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 2003 RWP (SJWC, 2003).

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

There are three dams with high hazard potential (Farmington Lake Dam, Jackson Lake Dam, and Thirtieth Street Dam). The high hazard potential is related to dams where failure would likely result in loss of human life needed maintenance, seepage, woody vegetation, and a lack of design information.

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

River	Reservoir	Primary Purpose	Operator	Date Completed	Total Storage Capacity (acre-feet)	Surface Area (acres)	Dam Height (feet)	Dam Length (feet)
San Juan County								
San Juan	Navajo Reservoir	Conservation storage	Bureau of Reclamation	1962	1,701,300 [a]	15,610	402	3,648
Animas (off-channel)	Farmington Lake	Conservation storage	City of Farmington	1964	7,023	198	117	1,075
Chaco Wash	Morgan Lake	Conservation storage	Arizona Public Service Company of New Mexico	1961	42,800	1,260	133	6,760

Source: USACE, 1999 [a] USBR, 2006

Table 5-7. Dams with Dam Safety Deficiency Rankings

Dam	Condition Assessment [a]	Deficiency	Hazard Potential [b]	Estimated Cost to Repair ($)
San Juan County				
Bolack No 1 Dam	Poor	Unauthorized modification Tension crack Lack of design information	Low	100,000
Farmington Lake Dam	Fair	Maintenance needed	High	100,000
Jackson Lake Dam	Poor	Deteriorated outlet works Seepage Woody vegetation Lack of design information	High	1,000,000
San Juan North Pond 1	Poor	Lack of design information	Significant	100,000
San Juan North Pond 2	Poor	Lack of design information	Significant	100,000
San Juan North Pond 3	Poor	Lack of design information	Significant	100,000
San Juan South Pond 1	Poor	Lack of design information	Significant	100,000
San Juan South Pond 2	Poor	Lack of design information	Significant	100,000
San Juan South Pond 3	Poor	Lack of design information	Significant	100,000
San Juan South Pond 4	Poor	Lack of design information	Significant	100,000
San Juan South Pond 5	Poor	Lack of design information	Significant	100,000
Thirtieth Street Dam	Poor	Lack of design information	High	100,000
El Paso Natural Gas Dam No. 5	Fair	Maintenance needed	Low	10,000
Rio Arriba County				
Crowley Irrigation System	Poor	Spillway <30% of required flood Outlet deteriorated w downstream contrl seepage on downstream slope	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.

PMP = Probable maximum precipitation

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

[a] Condition assessment:

	2008 US Army Corps of Engineers Criteria (adopted by NM OSE in FY09)	*NMOSE Spillway Risk Guidelines*
Satisfactory:	No existing or potential dam safety deficiencies are recognized. Acceptable performance is expected under all loading conditions in accordance with State Engineer rules and regulations for dams or tolerable risk guidelines.	Spillway capacity ≥ 70% of the spillway design flood (SDF).
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.
Unsatisfactory:	A dam safety deficiency is recognized that requires immediate or emergency remedial action for problem resolution.	

[b] Hazard Potential Classifications:

High:	Dams where failure or mis-operation would likely result in loss of human life.
Significant:	Dams where failure or mis-operation would likely not result in loss of human life but could cause economic loss, environmental damage, disruption of lifeline facilities, or could impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but may be located in populated areas with significant infrastructure.
Low:	Dams where failure or mis-operation would likely not result in loss of life but may result in minimal economic or environmental losses. Losses would be principally limited to the dam owner's property

Several San Juan Stream Improvement projects were implemented in the river reaches below the Navajo Dam between 2005 and 2011 to improve flows and habitat for fish (Float ‘n Fish, 2015).

5.3 Groundwater Resources

Groundwater accounted for only about 1 percent of all water diversions in the year 2010 (Longworth et al., 2013). Even though it is a small portion of the water supply, the 2003 RWP (SJWC, 2003) indicated a need to develop backup groundwater supplies in some locations to provide a buffer for potential drought conditions.

5.3.1 Regional Hydrogeology

The geology that controls groundwater occurrence and movement within the planning region was described in the 2003 RWP (SJWC, 2003), based on studies by Phillips et al. (1984), Stone et al. (1983), Kernodle (1996), and Levings et al. (1996). A map illustrating the surface geology of the planning region, derived from a geologic map of the entire state of New Mexico by the New Mexico Bureau of Geology & Mineral Resources (2003), is included as Figure 5-10. The Colorado Plateau is the only physiographic region to exist within the planning region (Hawley, 1986). Two important characteristics of the hydrogeologic system in the San Juan Basin are horizontal flow through aquifer sandstones and, to a smaller extent, vertical flow through the intercalated shale aquitards (Dam, 1995; Kernodle, 1996; Levings et al., 1996; Lorenz and Cooper, 2003).

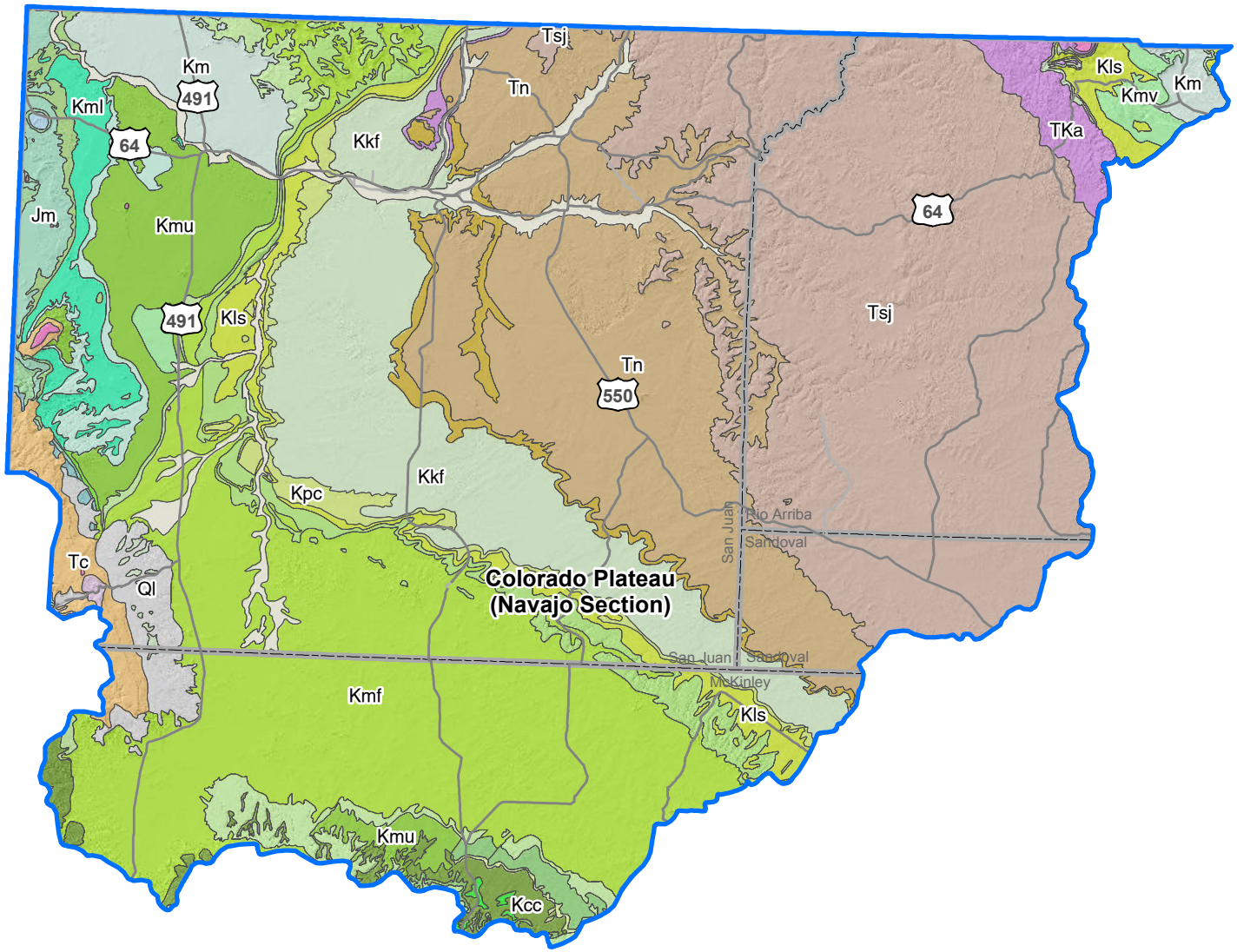
5.3.2 Aquifer Conditions

As reported in the 2003 RWP (SJWC 2003), the Ojo Alamo Sandstone is the aquifer with the highest potential to supply adequate groundwater for use by the metropolitan areas along the San Juan River. This aquifer produced a median flow rate of 12 gallons per minute (gpm) in 19 wells that were tested. Further aquifer characteristics have been discussed in the 2003 RWP (SJWC, 2003).

The Morrison Formation is another major aquifer in the San Juan Structural Basin. It is a non-Marine sandstone, mudstone, shale, with some limestone from the Jurassic age. It is also a source of uranium. This aquifer has a median production flow rate of 30 gpm, based on the review of 83 wells; further discussion is provided in the accepted water plan (San Juan Water Commission, 2003).

In order to evaluate changes in water levels over time, the USGS monitors groundwater wells throughout New Mexico (Figure 5-11). Hydrographs illustrating groundwater levels versus time, as compiled by the USGS (2014b), were selected for five monitor wells with longer periods of record and are shown on Figure 5-12. These hydrographs indicate that water levels are decreasing in some wells and increasing in others. It is important for individual groundwater users to monitor their water levels in relation to the entire water column available, but declining water levels in not a regional issue in the San Juan Basin.

S:\PROJECTS\WR12.0165_STATE_WATER_PLAN_2012\GIS\MXDS\FIGURES_2016\SAN_JUAN_BASIN\FIG5-10A_GEOLOGY.MXD 5/6/2016



N

0 9 18 Miles

Explanation

- Physiographic province
- County
- Water planning region

Sources: 1. NMBGMR, 2003
2. DBS&A, 2005
3. Hawley, 1986

SAN JUAN BASIN
REGIONAL WATER PLAN 2016

Geology and Physiographic Provinces

Figure 5-10a

Source: NMBGMR, 2003

SAN JUAN BASIN
REGIONAL WATER PLAN 2016
Geology Explanation

Figure 5-10b

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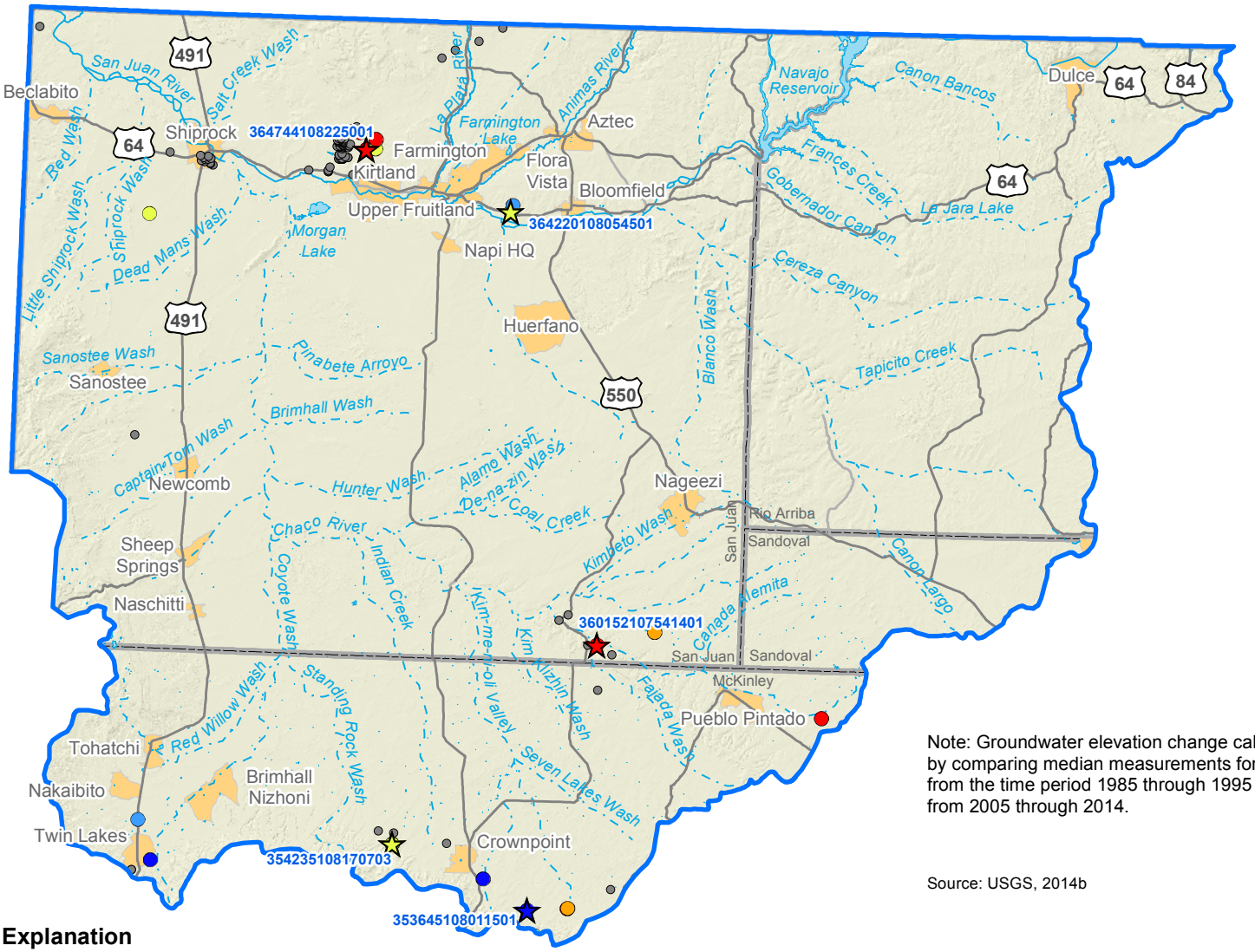
S:\PROJECTS\WR12.0165_STATE_WATER_PLAN_2012\GIS\MXDS\FIGURES_2016\SAN_JUAN_BASIN\FIG5-11_USGS_WELLS.MXD 5/11/2016



Note: Groundwater elevation change calculated by comparing median measurements for each well from the time period 1985 through 1995 with those from 2005 through 2014.

Source: USGS, 2014b

Explanation

- Selected USGS-monitored well
- Other USGS-monitored well
- Stream (dashed where intermittent)
- Lake
- City
- County
- Water planning region

Groundwater elevation change (ft)

- Decreased more than 20 ft
- Decreased 10 to 20 ft
- Decreased 1 to 10 ft
- Changed less than 1 ft
- Increased 1 to 10 ft
- Increased more than 10 ft

N

0 9 18 Miles

SAN JUAN BASIN
REGIONAL WATER PLAN 2016

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

Figure 5-11

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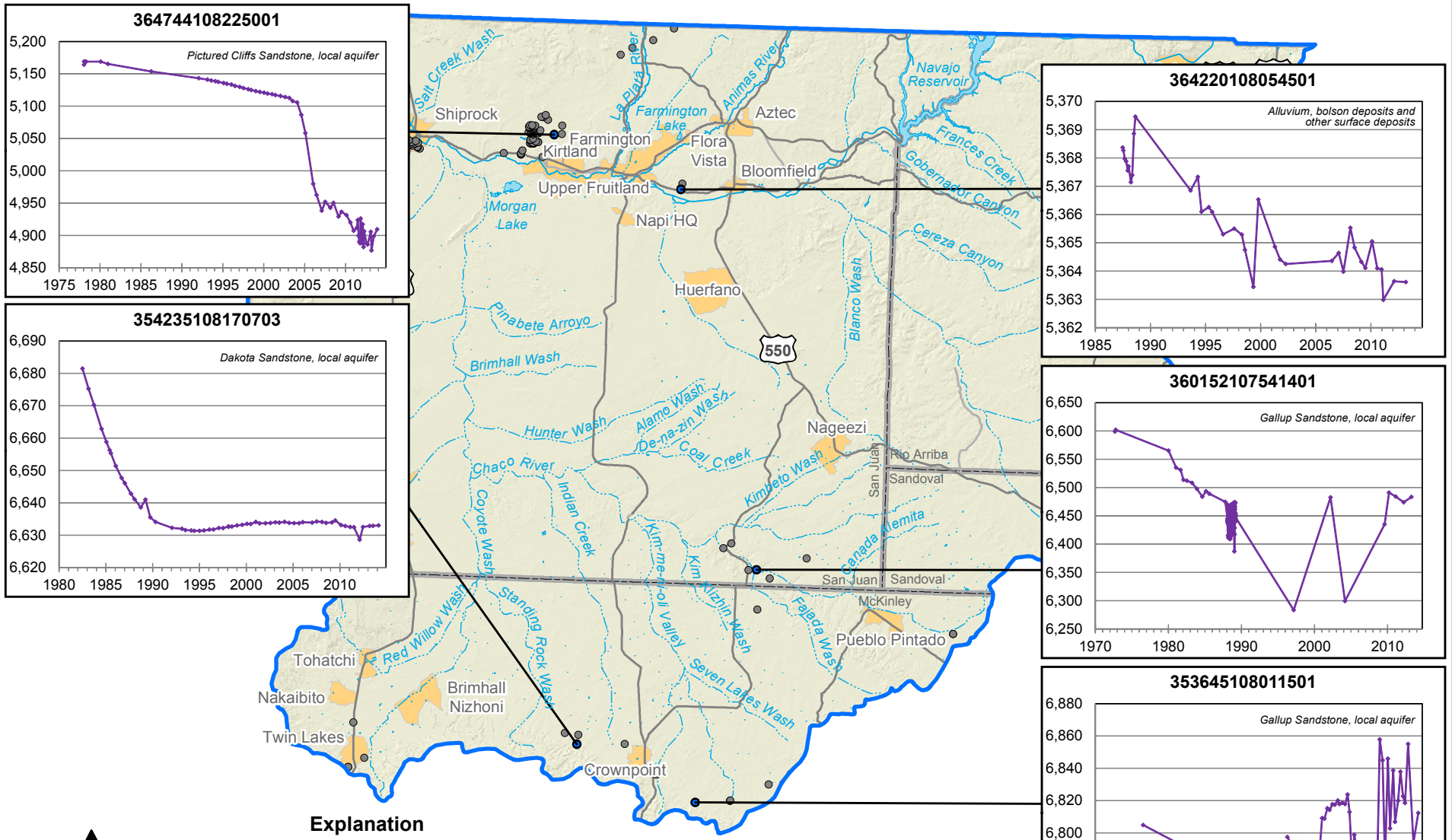

Figure 5-12

SAN JUAN BASIN
REGIONAL WATER PLAN 2016

Hydrographs of Selected Wells

Recharge of the aquifers in the San Juan Structural Basin generally occurs in the topographically high outcroppings along the basin margin. Discharge occurs generally in the low elevations within the basin, specifically to the San Juan River in the northwest portion of the region. Because much of the groundwater is confined, precipitation must fall on the outcrop of the geologic unit and then travel downgradient to the saturated aquifer level for recharge to occur; therefore, groundwater recharge from precipitation is minimal. A 1996 USGS modeling study used a steady-state flow model to estimate recharge in the San Juan Structural Basin (Kernodle, 1996). The model indicates that the recharge rate ranges between 0.1 and 0.8 inch per year. According to the 2003 RWP (SJWC, 2003), the average recharge rate is 0.14 inch per year or about 1 percent of the yearly precipitation.

With groundwater providing only 1 percent of the water supply, there are no major well fields in the region.

5.4 Water Quality

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

Surface water quality in the San Juan Basin Water Planning Region is evaluated through periodic monitoring and comparison of sample results to pertinent water quality standards. Several reaches of the San Juan, La Plata, and Animas rivers, as well as several lakes, 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. Specific pollutants identified in the San Juan Basin region include E. coli, temperature, sediment/turbidity, nutrients, biological indicators, phosphorus, selenium, dissolved oxygen, and mercury in fish tissue. A recent study completed in the region identifies additional sources of pollutants for specific reaches identified in the 303(d) list (SJWG et al., 2016).

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N

0 9 18 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

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

SAN JUAN BASIN
REGIONAL WATER PLAN 2016

Water Quality-Impaired Reaches

Figure 5-13

Table 5-8. Total Maximum Daily Load Status of Streams in the San Juan Basin Water Planning Region

Waterbody Name [a] (basin, segment)	Assessment Unit ID	Affected Reach (miles [b])	Probable Sources of Pollutant	Uses Not Fully Supported [c]	Specific Pollutant	IR Category [d]
San Juan County						
Animas River (Estes Arroyo to So. Ute Indian Tribe bnd)	NM-2404_00	18.8	Site clearance (new development or infill) MS4 discharges Recreational pollution sources Source unknown Drought-related impacts Loss of riparian habitat Irrigated crop production Impervious surface/parking lot runoff Rangeland grazing Natural sources [e] Erosion from dirt road network [e] Riparian grazing [e] On-site treatment systems (septic) [e] Illegal dumps or inappropriate waste disposal [e]	PC ColdWAL	Escherichia coli Phosphorus (total) Temperature, water Turbidity	5/5B

Source: NMED, 2014a

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

[b] Unless otherwise noted.

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

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

[e] Additional probable sources identified in Lower Animas Watershed Based Plan (BUGS, 2011) and San Juan Watershed Group Microbial Source Tracking study (SJWG, 2012).

[f] Acres

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

Table 5-8. Total Maximum Daily Load Status of Streams in the San Juan Basin Water Planning Region

Waterbody Name [a] (basin, segment)	Assessment Unit ID	Affected Reach (miles [b])	Probable Sources of Pollutant	Uses Not Fully Supported [c]	Specific Pollutant	IR Category [d]
San Juan County (cont.)						
Animas River (San Juan River to Estes Arroyo)	NM-2403.A_00	16.83	Site clearance (new development or infill) Channelization Illegal dumps or other inappropriate waste disposal Municipal point source discharges Waterfowl MS4 discharges Streambank modification/destabilization - Agriculture Recreational pollution sources Drought-related impacts Municipal (high density area) Irrigated crop production Impervious surface/parking lot runoff Baseflow depletion Flow alterations from water diversions Urban runoff/storm sewers Erosion from dirt road network [e] Riparian grazing [e] On-site treatment systems (septic) [e]	WWAL MCWAL PC	Escherichia coli Nutrient/eutrophication Biological indicators Temperature, water	4A
Gallegos Canyon (San Juan River to Navajo bnd)	NM-9000.A_060	0.46	Irrigated crop production Natural sources	WH WWAL	Selenium	4A
Jackson Lake	NM-9000.B_005	66.7 [f]	Not assessed			3/3A

Source: NMED, 2014a

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

[b] Unless otherwise noted.

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

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

[e] Additional probable sources identified in Lower Animas Watershed Based Plan (BUGS, 2011) and San Juan Watershed Group Microbial Source Tracking study (SJWG, 2012).

[f] Acres

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

Table 5-8. Total Maximum Daily Load Status of Streams in the San Juan Basin Water Planning Region

Waterbody Name [a] (basin, segment)	Assessment Unit ID	Affected Reach (miles [b])	Probable Sources of Pollutant	Uses Not Fully Supported [c]	Specific Pollutant	IR Category [d]
San Juan County (cont.)						
La Plata R (McDermott Arroyo to So. Ute Indian Tribe bnd)	NM-2402.A_01	8.04	On-site treatment systems (septic) Source unknown Animal feeding operations (NPS) Drought-related impacts Loss of riparian habitat Rangeland grazing Streambank modifications/destabilization Flow alterations from water diversions	MCWAL MWWAL PC	Escherichia coli Nutrient/eutrophication Biological indicators	5/5A
La Plata River (San Juan River to McDermott Arroyo)	NM-2402.A_00	16.77	Source unknown	PC MCWAL	Escherichia coli Low flow alterations Oxygen, dissolved Sedimentation/siltation	5/5C
Lake Farmington (Beeline Reservoir)	NM-9000.B_006	198 [f]	Source unknown	ColdWAL WWAL	Mercury Mercury in fish tissue	5/5A
Los Pinos River (Navajo Reservoir to CO border)	NM-2407.A_10	1.35	Not assessed			3/3A
Navajo Reservoir	NM-2406_00	13,151.19 [f]	Source unknown	ColdWAL	Mercury in fish tissue Temperature, water	5/5A

Source: NMED, 2014a

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

[b] Unless otherwise noted.

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

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

[e] Additional probable sources identified in Lower Animas Watershed Based Plan (BUGS, 2011) and San Juan Watershed Group Microbial Source Tracking study (SJWG, 2012).

[f] Acres

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

Table 5-8. Total Maximum Daily Load Status of Streams in the San Juan Basin Water Planning Region

Waterbody Name [a] (basin, segment)	Assessment Unit ID	Affected Reach (miles [b])	Probable Sources of Pollutant	Uses Not Fully Supported [c]	Specific Pollutant	IR Category [d]
San Juan County (cont.)						
San Juan River (Animas River to Canon Largo)	NM-2401_00	34.99	Petroleum/natural gas activities (permitted) Drought-related impacts Loss of riparian habitat Illegal dumps or inappropriate waste disposal [e] Riparian grazing [e] On-site treatment systems (septic) [e]	MCWAL	Sedimentation/siltation	4A
San Juan River (Navajo bnd at Hogback to Animas River)	NM-2401_10	24.34	Municipal point source discharges On-site treatment systems (septic) Source unknown Drought-related impacts Rangeland grazing Riparian grazing [e] On-site treatment systems (septic) [e] Illegal dumps or inappropriate waste disposal [e]	PC MCWAL	Escherichia coli Sedimentation/siltation Turbidity	5/5C

Source: NMED, 2014a

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

[b] Unless otherwise noted.

[c] ColdWAL = Coldwater aquatic life
MCWAL = Marginal coldwater aquatic life
MWWAL = Marginal warmwater aquatic life
PC = Primary contact
WH = Wildlife habitat
WWAL = Warm water aquatic life

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

[e] Additional probable sources identified in Lower Animas Watershed Based Plan (BUGS, 2011) and San Juan Watershed Group Microbial Source Tracking study (SJWG, 2012).

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

Table 5-8. Total Maximum Daily Load Status of Streams in the San Juan Basin 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 5/5A: Impaired for one or more designated or existing uses and a TMDL is underway or scheduled. AUs are listed in this category if the AU is impaired for one or more designated uses by a pollutant. Where more than one pollutant is associated with the impairment of a single AU, the AU remains in IR Category 5A until TMDLs for all pollutants have been completed and approved by USEPA.

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

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

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/). Many of the discharges are wastewater treatment plants but there are also three coal mine discharge permits.

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

Table 5-9. Municipal and Industrial NPDES Permittees in the San Juan Basin Water Planning Region

Permit No	Municipality/Industry [a]	Permit Type [b]
San Juan County		
NM0028762	Aztec, City of/WTP	Utility
NM0020168	Aztec, City of/WWTP [c]	Municipal (POTW)
NM0020770	Bloomfield, City of/WWTP [c]	Municipal (POTW)
NM0029319	Central Consolidated School District No 22	Private domestic
NM0000043	Farmington, City of/Animas Steam Plant	Utility
NM0031135	Farmington, City of/Bluffview Power Plant	Utility
NM0020583	Farmington, City of/WWTP [c]	Municipal (POTW)
NM0029025	Harper Valley Home Owners Association	Private domestic
NM0030953	Navajo Dam DWC & MSW, Inc.	Utility
NM0028606	Public Service Co. of NM/San Juan Station [c]	Utility
NM0029505	San Juan Coal Company/La Plata Mine	Coal mine
NM0028746	San Juan Coal Company/San Juan Mine [d]	Coal mine
Rio Arriba County		
NM0030520	Dulce, WWTP / Jicarilla Apache Utility Authority	Private domestic
McKinley County		
NM0030996	Lee Ranch Coal Company/El Segundo Mine	Coal mine

Source: NMED, 2016c

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

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

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

[d] NMED lists multiple outfall locations

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

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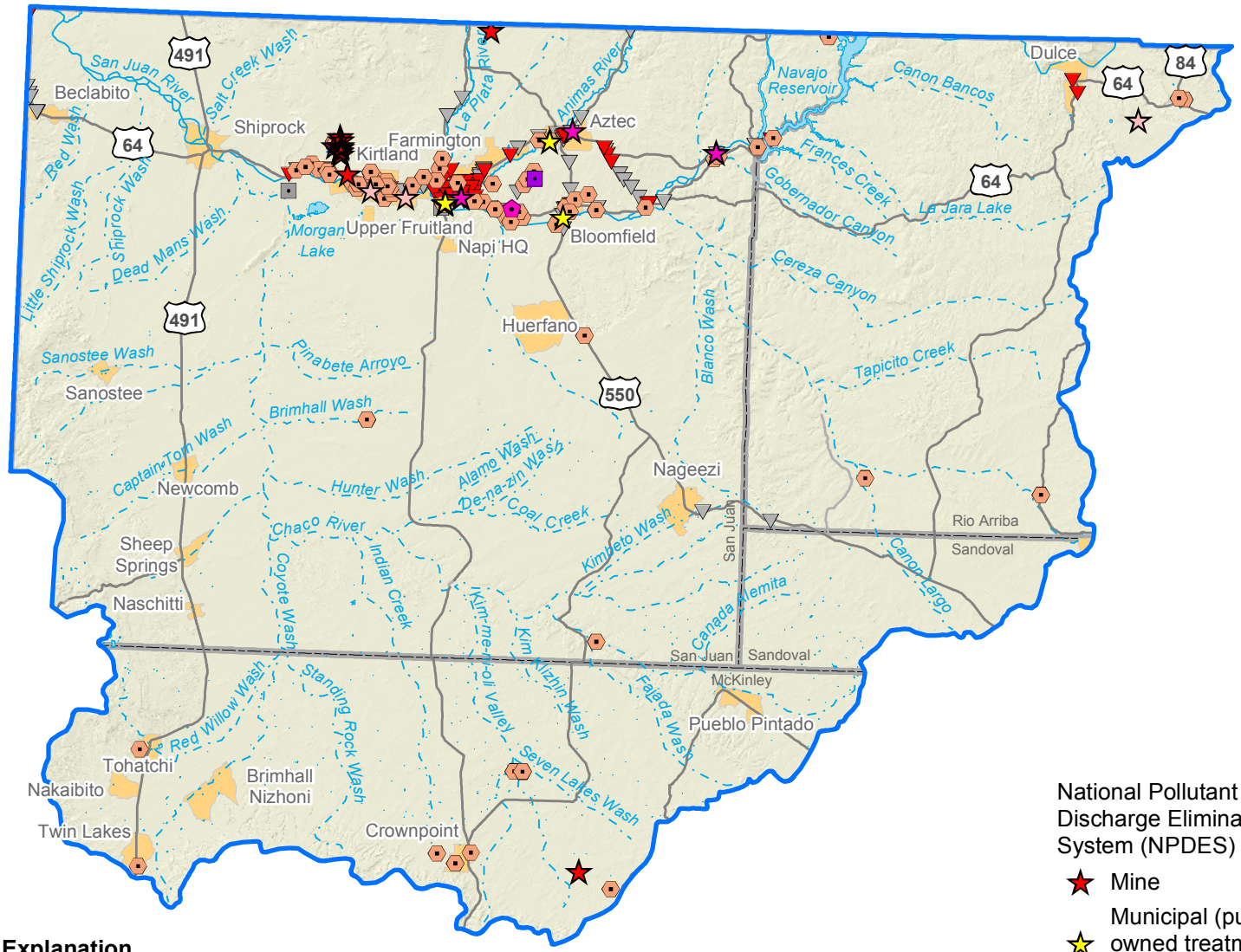
Sources:
NMED, 2014b
NMED, 2015a
NMED, 2015b
NMED et al., 2016
NMED, 2016a
NMED, 2016b
NMED, 2016c
U.S. EPA, 2013
U.S. EPA, 2016a
U.S. EPA, 2016b



N

0 9 18 Miles

Explanation

- Stream (dashed where intermittent)
- Lake
- City
- County
- Water planning region
- Superfund site
- Groundwater discharge permit
- Permitted active landfill
- Closed landfill

Leaking underground storage tank site
- Active
- No further action

National Pollutant Discharge Elimination System (NPDES) permit
- Mine
- Municipal (publicly owned treatment work)
- Domestic
- Utility

SAN JUAN BASIN
REGIONAL WATER PLAN 2016

Potential Sources of Contamination

Figure 5-14

Table 5-10. Groundwater Discharge Permits in the San Juan Basin Water Planning Region

County	Facility Name [a]	Permit No.	Status [b]	Permitted Discharge Amount (gpd)
San Juan	Blanco Elementary School	DP-1566	Active	4,500
	Boss Wash	DP-1500	Active	3,500
	Calber Farms RV Park	DP-1724	Pending	—
	Chaco Culture National Historical Park	DP-419	Active	19,500
	Dam Site Mobile Home and RV Park	DP-1073	Active	3,333
	DJ's Car Wash	DP-1499	Active	2,100
	Envirotech Inc	DP-955	Active	9,999
	Farmington (City of) - Sludge Disposal Project	DP-686	Active	3
	Farmington Family Sports Complex	DP-1295	Active	9,600
	Four Corners Packing Plant	DP-1086	Active	2,000
	Fruitland Trading Co	DP-964	Active	5,673
	Hunts Meat Company	DP-1070	Active	3,000
	J Bar J Meats	DP-1388	Active	300
	Jet Wash	DP-1267	Active	7,000
	JJ Mobile Home Park	DP-1690	Active	3,650
	Kirtland Mobile Home Park	DP-66	Active	16,800
	La Plata Mobile Home Park	DP-134	Active	9,500
	Lagoon Limited	DP-1116	Active	13,500
	Lakeview Heights Subdivision	DP-458	Active	8,000

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

gpd = Gallons per day

— = Not listed on GWQB web site

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

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

Table 5-10. Groundwater Discharge Permits in the San Juan Basin Water Planning Region

County	Facility Name [a]	Permit No.	Status [b]	Permitted Discharge Amount (gpd)
San Juan (cont.)	LJ's Car Wash	DP-1138	Active	9,500
	Mcgee Park - San Juan County	DP-141	Active	50,000
	Navajo Lake State Park	DP-1304	Active	22,000
	Paramount Mobile Home and RV Park	DP-1727	Active	11,300
	Paxair Inc. - Kirtland Facility	DP-1422	Active	15,200
	Payne RV Park	DP-1811	Active	2,240
	PNM - San Juan Generating Station	DP-1327	Active	2,557,000
	PNM - San Juan Generating Station	DP-306	Active	1,267
	Riverside Livestock, LLC	DP-863	Active	850
	San Juan Meats	DP-378	Active	1,800
	Teverbaugh Family Living Trust Park	DP-1763	Active	4,800
	Thriftway Marketing Corp - Thriftway NO 220	DP-1584	Active	77,760
	Valley Pawn and Laundry	DP-908	Active	24,155
	Vision Mobile Home Park	DP-1691	Active	8,700
	Wagon Wheel Country Court LLC	DP-175	Active	15,300
	Wild Properties Food Court	DP-1720	Pending	—
	Williams Four Corners LLC Office Building	DP-1797	Active	3,450
	XTO Energy Crouch Mesa Facility	DP-1608	Active	4,200
Rio Arriba	Korcz Sanitation	DP-914	Active	1,000

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 San Juan Basin Water Planning Region

County	Facility Name [a]	Permit No.	Status [b]	Permitted Discharge Amount (gpd)
McKinley	Crownpoint (Town of) - Wastewater Treatment Plant	DP-749	Active	240,000
	El Segundo Mine	DP-1679	Active	5,120
	Giant Store #7204	DP-1794	Pending	3,416

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

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

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

gpd = Gallons per day

— = Not listed on GWQB web site

5.4.1.2 Remediation Sites

The region contains one site, the Lee Acres Landfill, listed by the U.S. EPA (2014) as a Superfund site (Table 5-11). Sites undergoing investigation or cleanup pursuant to other federal authorities or state authority can be found on the EPA website (https://www.epa.gov/superfund/national-priorities-list-npl-sites-state#NM).

Table 5-11. Superfund Sites in the San Juan Basin Water Planning Region

Site Location	Site Name [a]	Site ID	EPA ID	Status [b]
San Juan County				
US Highway 64 btwn Farmington and Bloomfield	Lee Acres Landfill (USDOI)	NMD980750020	600911	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 San Juan Basin region are identified on Figure 5-14. Many of the UST sites listed in the NMED database require no further action and are not likely to pose a water quality threat. Sites that are being investigated or cleaned up by the state or a responsible party, as identified on Table 5-12, should be monitored for their potential impact on water resources. Additional details regarding any groundwater impacts and the status of site investigation and cleanup efforts for individual sites can be obtained from the NMED database, which is accessible on the NMED website (https://www.env.nm.gov/ust/lists.html).

5.4.1.4 Landfills

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

Table 5-12. Leaking Underground Storage Tank Sites in the San Juan Basin Water Planning Region

City [a]	Release/Facility Name [b,c]	Release ID	Facility ID	Physical Address [c]	Status [d]
San Juan County					
Aztec	7 2 11 Food Store 38	3398	26269	201 Aztec Blvd NE	Aggr Cleanup Completed, Resp Party
	Bar F 1	384	26845	407 Aztec Blvd	Aggr Cleanup Completed, Resp Party
	Circle K 469	2087	1095	101 Aztec Blvd	Investigation, State Lead, CAF
	Eds Classic Auto	1209	27861	303 E Aztec Blvd	Aggr Cleanup Completed, Resp Party
	Permco Aztec	66	26802	Main and Chaco	Cleanup, Responsible Party
	Sundial Delimart 2	1580	30819	417 N Main St	Cleanup, Responsible Party
	Thriftway #221	2009	1888	408 Aztec Blvd	Investigation, Responsible Party
Blanco	Bills Custom Tackle	2427	26943	2222 US Hwy 64	Cleanup, Responsible Party
	Navajo Corners	935	29575	2268 Hwy 64	Investigation, Responsible Party
Shiprock	Shiprock Sewer Lift	3035	30586	Hwy 550 Shiprock	Referred to US EPA
	Thriftway 241/259 Wht Egle	1822	31099	Unknown	Referred to US EPA
Waterflow	Giant 265	3573	1908	3215 Hwy 64	Pre-Investigation, Confirmed Release
	Giant DBA Mustang 7270	4430	1908	3215 Hwy 64	Cleanup, Responsible Party
	Old Turquioise Bar	4577	54645	Highway 64	Investigation, Responsible Party
Navajo Dam	Sportsman Inn	2248	30732	Hwy 511 and 173	Investigation, Responsible Party
Kirtland	Maverik Store #59	2491	31811	4357 US Hwy 64	Investigation, Responsible Party

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

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

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

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

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

Table 5-12. Leaking Underground Storage Tank Sites in the San Juan Basin Water Planning Region

City [a]	Release/Facility Name [b,c]	Release ID	Facility ID	Physical Address [c]	Status [d]
San Juan County (cont.)					
Kirtland (cont.)	Mustang 7262, Kirtland	4427	29522	4220 US Hwy 64	Investigation, Responsible Party
	Thriftway 209	1178	1881	4130 US Hwy 64	Cleanup, Responsible Party
Farmington	10342 Thriftway 292, Farmington	4434	1913	1020 Hwy 371	Investigation, Responsible Party
	7-2-11No23	4685	26261	1800 Old Bloomfield Rd	Pre-Investigation, Confirmed Release
	Anderson Shell	377	29234	2110 N Sullivan	Pre-Investigation, Confirmed Release
	Auto Scrubber	863	26791	2116 E Main	Cleanup, Responsible Party
	Bj Services Co Usa	2342	31562	3250 Southside River Road	Cleanup, Responsible Party
	Circle S Number One	4050	27377	3100 E Bloomfield Hwy	Pre-Investigation, Confirmed Release
	Dats Trucking	4589	47576	5656 Hwy 64	Investigation, Responsible Party
	Farmington Oil Co	4486	51700	302 S Lorena	Cleanup, Responsible Party
	Fast Gas	3124	27990	514 W Pinon	Cleanup, Responsible Party
	Food Mart 6	4525	28073	219 E Main	Investigation, Responsible Party
	Former Cardlock #2	2319	29220	2500 San Juan Blvd	Aggr Cleanup Completed, Resp Party
	Former Graves Quince St Bulk Plant	4393	52261	109 W Quince St	Cleanup, Responsible Party
	Four Four Inc	3256	28147	3000 Bloomfield Hwy	Cleanup, Responsible Party
	Foutz and Bursum Constr	3098	28155	3620 E Main St	Cleanup, Responsible Party
	Fuel Mart Corp	4681	28197	3920 Bloomfield Hwy	Pre-Investigation, Confirmed Release

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

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

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

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

[d] Pre-Investigation, Suspected Release: Release not confirmed by definition
Pre-Investigation, Confirmed Release: Confirmed release as by definition
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CAF: Corrective action fund
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Table 5-12. Leaking Underground Storage Tank Sites in the San Juan Basin Water Planning Region

City [a]	Release/Facility Name [b,c]	Release ID	Facility ID	Physical Address [c]	Status [d]
San Juan County (cont.)					
Farmington (cont.)	G&G Auto	890	28204	701 E 20th	Aggr Cleanup Completed, Resp Party
	Gasamat 556	442	31828	1500 San Juan Blvd	Cleanup, Responsible Party
	GIANT 14	547	1344	3341 E Main St	Cleanup, Responsible Party
	Giant 614	3170	1344	3341 E Main St	Cleanup, Responsible Party
	Giant 805	4701	28072	301 E 20th	Investigation, Responsible Party
	Graves #3	2290	28385	1721 E Twentieth St	Investigation, Responsible Party
	Graves 1	1208	28392	551 E Main St	Cleanup, Responsible Party
	Graves O & G	927	28391	761 S Miller	Aggr Cleanup Completed, Resp Party
	Graves Oil And Butane B	3206	27382	2707 E Main St	Investigation, Responsible Party
	Havens Trucking Inc.	4448	51181	1205 Mission Ave	Investigation, Responsible Party
	MOC	85	29517	101 N Browning Parkway	Investigation, Responsible Party
	Municipal Operations Center A	4544	29517	101 N Browning Parkway	Cleanup, Responsible Party
	Mustang - No 220	4546	29521	609 E 20th St	Cleanup, Responsible Party
	Mustang- No159	4446	29520	507 E Broadway	Investigation, Responsible Party
	Mustang 7211	4433	31834	2700 W Main	Investigation, Responsible Party
	NMSHTD Farmington	1438	26248	SR Jct 170 550	Aggr Cleanup Completed, Resp Party

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

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

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

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

[d] Pre-Investigation, Suspected Release: Release not confirmed by definition
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Table 5-12. Leaking Underground Storage Tank Sites in the San Juan Basin Water Planning Region

City [a]	Release/Facility Name [b,c]	Release ID	Facility ID	Physical Address [c]	Status [d]
San Juan County (cont.)					
Farmington (cont.)	Sevenbar four Corners DBA Atlantic Aviation	4700	28143	1400 W Navajo	Investigation, Responsible Party
	Sun Dial Deli Mart 1	3378	30809	2615 E Main	Cleanup, Responsible Party
	Tedken Oil Co	1816	31029	200 S Fairview	Aggr Cleanup Completed, Resp Party
	Thriftway #217/Sundial #12	2783	31836	8180 E Main	Investigation, Responsible Party
	Thriftway #220	2035	29521	609 E 20th St	Investigation, Responsible Party
	Thriftway 211 Farm	208	31834	2700 W Main	Investigation, Responsible Party
	Thriftway 243	615	1897	1414 San Juan Blvd	Cleanup, Responsible Party
	VCR Service	1516	31496	1915 N Butler	Investigation, Responsible Party
	Vortac	2338	27982	4 Miles ENE from Sandstone	Investigation, Responsible Party
	W&C Contracting Co	2648	31511	5000 E Main	Aggr Cleanup Completed, Resp Party
Bloomfield	Amigo Mart #11	4556	27191	100 E Blanco Blvd	Investigation, Responsible Party
	Bar F 2 Bloomfield	89	28315	220 S Bloomfield Blvd	Aggr Cleanup Completed, St Lead, CAF
	Circle S #3	2580	27378	1107 Blanco Hwy	Pre-Investigation, Confirmed Release
	Giant Dba Mustang 7214	4471	31822	602 W Broadway	Cleanup, Responsible Party
	Kilo Partners	971	31477	405 S Bloomfield Blvd	Aggr Cleanup Completed, Resp Party
	Mustang 210	4555	31812	204 S Bloomfield Blvd	Cleanup, Responsible Party

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

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

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

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

[d] Pre-Investigation, Suspected Release: Release not confirmed by definition
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Federal Facility: Responsibility under the Federal Govt

Table 5-12. Leaking Underground Storage Tank Sites in the San Juan Basin Water Planning Region

City [a]	Release/Facility Name [b,c]	Release ID	Facility ID	Physical Address [c]	Status [d]
San Juan County (cont.)					
Bloomfield (cont.)	Sundial Deli Mart 3	1536	30823	121 S Bloomfield Blvd	Cleanup, Responsible Party
	Thriftway 214	1521	31822	602 W Broadway	Cleanup, Responsible Party
Rio Arriba County					
Dulce	Dulce Independent Schools	4511	51000	113 Hawks Dr	Cleanup, Responsible Party
	Gomez Stop N Go	3581	28359	State Rd 372	Cleanup, Responsible Party
	Hwy Dept 4564	236	26247	US 64 at Mile Post 135 5 on Narrow Gauge Rd	Referred to US EPA
Navajo Dam	Sims Mesa Marina	4686	54559	No12 Highway 527	Pre-Investigation, Confirmed Release

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

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

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

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State Lead: State has assumed responsibility for mitigation of release
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Table 5-13. Landfills in the San Juan Basin Water Planning Region

County	Landfill Name [a]	Landfill Operating Status	Landfill Closure Date
San Juan	Farmington Landfill	Closed	—
	San Juan County Regional Landfill	Open	NA
	Sweetmeats	Closed	1999

Sources: San Juan Commission, 2003; NMED, 2000, 2014b, 2015a, 2015b

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

NA = Not applicable

— = Information not available

5.4.1.5 Nonpoint Sources

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

One approach to addressing nonpoint source pollution is through Watershed Based Planning or other watershed restoration initiatives that seek to restore riparian health and to address sources of contamination. Nonpoint source projects completed in the past few years include:

- Microbial source tracking within the San Juan watershed to identify sources of bacteria and nutrient pollution in the Animas and San Juan rivers
- Watershed planning for the Animas River, namely to reduce pollutant loads in the watershed
- The La Plata river riparian restoration which is designed to increase capacity in the floodplain and maintain water levels for wildlife
- Sediment reduction in the Largo Canyon under the Carrizo Watershed Cooperative Conservation Partnership Initiative
- Management of the invasion of woody vegetation along river corridors, a project with the U.S. Forest Service
- Restoration projects identified by the San Juan Soil & Water Conservation District as needed in the San Juan, La Plata, Carrizo, and Animas watersheds
- The San Juan Basin Watershed Management Plan (SJBWMP) (SJWG, 2005), completed in 2005

Though there is little groundwater use in the region, groundwater contamination due to septic tanks may be a concern in areas with shallow water tables (NMWQCC, 2002), contributing increased concentrations of:

- 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.

Another potential nonpoint source concern in the San Juan Basin region is water quality contamination from produced water. A 2006 study that evaluated geology and water chemistry from oil and gas wells in the region illustrated the high density of active wells (Simpson, 2006). Careful management of surface and downhole operations is important for water quality protection. The report indicated that four modeled formations—the Fruitland, Pictured Cliffs, Mesa Verde, and Dakota—all had high TDS levels. The occurrence of high TDS is largely a natural phenomenon, but is important to consider if additional groundwater use is considered. The report indicated that costs for hauling produced water to common treatment sites could be reduced with on-site treatment.

Salinity is also a nonpoint source issue in the San Juan Basin. The United States must comply with streamflow salinity standards for the Colorado River set by Minute 242 of the 1944 Mexican Water Treaty. The Colorado River Basin Salinity Control Forum assists in the evaluation and implementation of federal salinity-control measures upstream of Imperial Dam in Arizona that are meant to offset the impacts of water development on salinity of the Colorado River. The Forum also develops recommended salinity standards for the Colorado River system, and the New Mexico Water Quality Control Commission (NMWQCC) has adopted the salinity standards recommended by the Forum for the San Juan River and its tributaries within New Mexico.

5.5 Available Water Supply

The *Handbook* describes a technical approach (referred to there as a *platform)* for analyzing the water supply in each water planning region, but recognizes that other methods can be used to account for supply and demand. The regional water plan updates for other water planning

regions in New Mexico present an analysis of the administrative water supply for the region using the technical approach described in the Handbook, which is intended to represent supply considering both physical and legal limitations based on estimates of 2010 withdrawals. However, this plan for the San Juan Basin Water Planning Region does not incorporate the technical approach described in the handbook because it does not adequately address the following:

- The substantial reservoir storage capacity that was developed to allow the water in the San Juan River Basin to be used
- Authorized full development of federal water supply projects
- Actual diversion practices and reservoir operations on the San Juan and Animas rivers
- The water apportionments made to New Mexico by the Colorado River and Upper Colorado River Basin compacts

Because of these circumstances, the long-term amount of water from the San Juan River stream system that is available for use in New Mexico in normal (non-drought) years far exceeds the estimates of administrative water supply and severe drought-adjusted administrative water supply that would be calculated using the technical approach described in the handbook.

5.5.1 Normal Year Water Supply

The terms of the 1922 Colorado River Compact include a number of provisions important to the San Juan Basin region:

- The Upper Basin was apportioned the consumptive use of 7.5M acre-feet of water per year from the Colorado River system.
- The states of the Upper Division (New Mexico, Colorado, Utah, and Wyoming) will not cause the flow of the Colorado River at Lee Ferry to be depleted below an aggregate of 75,000,000 acre-feet in any period of ten consecutive years.
- The states of the Upper Division shall deliver at Lee Ferry additional water to supply one-half of any deficiency in the amount of surplus water available for delivery to Mexico under the 1944 Mexican Water Treaty.

Under the terms of the 1948 Upper Colorado River Basin Compact, New Mexico was apportioned 11.25 percent of the consumptive use available to the Upper Basin under the Colorado River Compact and remaining after deduction of 50,000 acre-feet apportioned to Arizona. The Secretary of the Interior determined in the 2007 Hydrologic Determination that at least 5.76M ac-ft/yr, on average, of consumptive use, excluding reservoir evaporation from Lake Powell, Flaming Gorge Reservoir, and the Aspinall Unit reservoirs of the CRSP is available to

the Upper Basin. After subtraction of the 50,000 acre-feet that was apportioned to Arizona, New Mexico's share of the Upper Basin yield is at least 642,380 ac-ft/yr of consumptive use for water development within the state. The amount of water diverted may substantially exceed the amount of water consumptively used, and return flows from uses of water diverted from the San Juan or Animas rivers generally are available for diversion to meet water demands for downstream uses.

5.5.2 Drought Supply

The variability in surface water supply over a multi-year period for a region with a large water supply reservoir is a good indicator of how vulnerable a planning region is to drought. 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 the San Juan Basin Planning Region, the State has adopted the following method:

- The drought adjustment is applied to the 2060 high demand scenario.
- The USGS stream gage on the Animas River (Animas River near Cedar Hill) was selected as a representative gage for the region.
- The ratio of the minimum value of the three-year moving average of the mean annual flow to the median value of mean annual flow for the Animas River near Cedar Hill stream gage was used to provide an estimate of the surface water supply adjusted for multi-year drought.

For the Animas River near Cedar Hill gage, the minimum value of the three year moving average is 406,580 acre-feet. The median value of annual flow at the gage is 624,711 acre-feet. The ratio of these two values is 65.1 percent (406,580/624,711). Based on the region's high scenario demand in year 2060 of 1,122,500 acre-feet, the drought-adjusted water supply is 730,750 acre-feet. This is a rough estimate of what may be available during an extended drought.

6. Water Demand

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

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

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

6.1 Historical and Present Uses

The most recent assessment of water use in the region was compiled by NMOSE for 2010. In addition to the *New Mexico Water Use by Categories 2010* report (Longworth et al., 2013), other information was used to provide a complete evaluation of historical or current diversions by category of use for the San Juan Basin Water Planning Region. Additionally, for consistency with NMISC water use reporting to the USBR and UCRC of consumptive uses and losses from the San Juan River Basin in New Mexico and the 2006 New Mexico Schedule of Anticipated Upper Basin Depletions, some water use categories used for this update to the 2003 RWP are different than those used in the *New Mexico Water Use by Categories 2010* report. Total diversions under historical or current conditions for each category of use are summarized in Sections 6.1.1 through 6.1.8.

6.1.1 Irrigation

The maximum historical annual diversion from Navajo Reservoir for the NIIP was about 234,300 acre-feet in 2012 based on metered diversions. Annual diversions from the San Juan River for the Fruitland and Hogback irrigation projects recently have averaged a total of about 114,600 ac-ft/yr based on diversions for these projects of about 100 cubic feet per second (cfs) and 170 cfs, respectively, over an irrigation season of April-October. These diversion amounts are recognized in recommendations for San Juan River operations and administration in New Mexico that have been agreed to since 2002 by major water users on the San Juan River and accepted by the State Engineer. The current diversion demand for Navajo ephemeral tributary irrigation uses was estimated at about 14,300 ac-ft/yr based on the Navajo Supplemental Decree irrigation diversion rights that were determined in consideration of historical irrigation uses and an aggregate project diversion requirement for these uses of about 28,500 ac-ft/yr less an average water supply shortage of about 50 percent.

Annual diversions for non-Navajo irrigation uses recently have averaged a total of about 291,900 ac-ft/yr based on:

- Diversions from the San Juan River for irrigation uses at rates adjudicated by the Echo Ditch Decree for the Turley, Citizens and Jewett Valley ditches, plus an additional 11.6 cfs under License 2870 for the Bloomfield Irrigation District, maintained over the bulk of the irrigation season of April-October, as recognized in the recommendations for San Juan River operations and administration in New Mexico

- Combined diversions from the San Juan River and/or Animas River of about 93 cfs for irrigation uses under the Farmers Mutual Ditch maintained over the bulk of the irrigation season (information provided by the NMOSE San Juan Basin Watermaster)

- The annual diversion limit for the Hammond Irrigation District based on licenses and permits approved by the State Engineer

- Ditch diversions from the Animas River for irrigation uses at rates adjudicated by the Echo Ditch Decree and maintained over the bulk of the irrigation season as currently administered by the NMOSE, with two exceptions: (1) the diversion rate for the Aztec Ditch was increased 2 cfs for transfers of irrigation rights into the ditch, and (2) the diversion rates for irrigation uses under the Lower Animas, Halford-Independent, Echo and North Farmington-Wright Leggett ditches were reduced to about 49 cfs, 38 cfs, 50 cfs and 10 cfs, respectively (information provided by the NMOSE San Juan Basin Watermaster)

- An estimated average divertible supply of about 35 cfs at the La Plata River at the Stateline gage for April-October (only the top priority ditches may divert from low flows of La Plata River during the summer and fall periods)

- Calculated project diversion requirements for remaining portions of the Archuleta Ditch now supplied by pump in the San Juan River and of ditches diverting from the Pine River for uses above Navajo Reservoir

- Jicarilla Apache Nation decreed irrigation diversion rights.

To compute annual irrigation diversion amounts using recognized current irrigation diversion rates for non-Navajo uses, it was assumed that (1) the irrigation ditches are maintained full during May-September and at 80 to 85 percent full in April and October (information provided by the NMOSE San Juan Basin Watermaster), or about 95 percent full averaged over the irrigation season, and (2) small amounts of diversion in March or November for irrigation or stock are not significant to the computation.

Thus, the total amount of diversion for irrigation uses in the San Juan River Basin in New Mexico under historical or recent conditions is as much as about 655,100 ac-ft/yr. This includes

diversions of water for the irrigation of crops grown on farms, ranches, and wildlife refuges in the basin, and it excludes diversions made by the San Juan-Chama Project (SJCP) and exported from the basin for irrigation uses in the Rio Grande Basin in New Mexico.

6.1.2 Livestock

The total amount of diversion for livestock uses in the San Juan River Basin in New Mexico under historical or recent conditions is about 4,400 ac-ft/yr. This includes (1) about 700 ac-ft/yr of diversion for livestock watering plus (2) about 3,700 ac-ft/yr of diversion into reservoir storage to replace evaporation losses calculated based on average stock pond storage and surface area conditions as limited by available water supply. It excludes diversions into storage to replace any seepage losses from stock ponds. Livestock watering uses include livestock water consumption, maintenance of self-supplied livestock facilities, and on-farm processing of poultry and dairy products.

6.1.3 Municipal/Domestic

Public water supply includes community water systems that consist of common collection, treatment, storage, and distribution facilities operated for the delivery of water to multiple service connections. This 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. Annual diversions for municipal or domestic water uses in the San Juan River Basin that are served by public water supply systems have recently approached somewhat less than 27,700 ac-ft/yr. This includes:

- About 22,200 ac-ft/yr of diversions for municipal uses by the cities of Farmington, Aztec, and Bloomfield, plus domestic uses of surface water by mutual domestic water user associations and other public water suppliers, based on maximum amounts of diversion of surface water for municipal or domestic uses by these entities in recent years
- About 2,600 ac-ft/yr of diversions from surface water for Navajo and Jicarilla municipal or domestic water uses served by the NTUA and BIA, respectively
- About 2,900 ac-ft/yr of scattered rural domestic uses supplied with groundwater mostly from the Indian Health Service (IHS), NTUA or other public water systems or community wells, but also including some water uses from self-supplied private residential domestic wells drilled prior to declaration of the San Juan Underground Water Basin or under well permits issued by the NMOSE pursuant to §72-12-1.1 NMSA 1978.

The total amount of municipal/domestic diversions noted above excludes diversions made by the SJCP and exported from the basin for municipal or domestic uses in the Rio Grande Basin in New Mexico and diversions of groundwater by the City of Gallup for export to the Little Colorado River Basin.

Some of the recent diversions for municipal or domestic water uses in the San Juan River Basin by non-Indian public water providers reportedly were made pursuant to ALP diversion permits; however, neither these entities nor the NMOSE has required accounting of diversions by specific decreed right, license, or permit. Also, given recent agreements resolving litigation and other water right issues affecting the cities of Farmington, Aztec, and Bloomfield and other members of the SJWC, and with litigation pending regarding the administration of the ALP water supply in Colorado, much of the diversions that historically might have been made by the SJWC's member entities under ALP diversion permits may in the future be accounted for under other water rights. Therefore, for purposes of this update to the 2003 RWP, all the non-Indian and Indian municipal and domestic diversions from surface water were included in the public water supply (non-project) subcategory for the analysis of historical or current conditions.

6.1.4 Industrial (self-supplied)

The annual amount of diversion for self-supplied industrial uses in the San Juan River Basin in New Mexico under recent conditions has been about 400 ac-ft/yr. This includes water use for self-supplied industrial uses not related to mineral production, such as the processing of raw materials, the manufacture of durable or nondurable goods, or construction projects. It excludes industrial uses that are supplied from municipal or domestic public water supply systems. For purposes of this regional water plan update, a very small amount of self-supplied commercial use for recreation areas and businesses was included in the industrial water use category. Commercial uses, including for irrigation of golf courses, that are supplied from public water supply systems were included in the municipal and domestic water use category, and irrigation of other golf courses from ditches was included in the irrigation water use category.

6.1.5 Power

The power category includes self-supplied power generating facilities and water used in conjunction with coal-mining operations that are directly associated with a power generating facility.

The maximum historical annual diversion for thermal electric power generation at the SJGS, including mining and reclamation activities at the San Juan and La Plata mines that have supplied coal for the power plant, was about 24,800 acre-feet in 2009. After 2009, the maximum annual diversion for power generation at the SJGS was about 22,200 acre-feet, but water use at the power plant might have been reduced in part due to outages at generation units for installation of emissions control equipment.

At the FCPP, three of the five coal-fired generation units were retired at the end of 2013. It was estimated that the annual diversion demand for the FCPP—including for water consumption at the power plant, coal mining activities at the Pinabete extension of the Navajo Mine, and replacement of Morgan Lake blowdown releases—will average about 26,500 ac-ft/yr after

installation of emission control equipment over the next couple of years, assuming that the remaining generation units operate as planned. This estimate was based on information provided by APSCo regarding anticipated water consumption at the FCPP and on data regarding recent water uses at the Navajo Mine and recent blowdown discharges at Morgan Lake.

Thus, the total amount of diversion for power generation uses in the San Juan River Basin in New Mexico under recent or current conditions is about 51,300 ac-ft/yr. This excludes:

- Water diverted by the City of Farmington for uses at the Animas Power Plant (APP) and the Bluff View Power Plant (BVPP), uses for which are included in the City's municipal and industrial water use amount
- Up to 205 cfs of diversion from the Animas River for hydropower generation at the City of Farmington hydroelectric power plant, for which the diverted water is quickly returned to the river in a short distance downstream from the point of diversion
- Water released from Navajo Reservoir through penstocks connected to the Navajo Dam power plant operated by the City of Farmington, which is used to generate hydropower only as a corollary of USBR operation of Navajo Dam for other purposes.

6.1.6 Minerals

The annual amount of diversion for mineral production in the San Juan River Basin in New Mexico under recent conditions has been about 1,600 ac-ft/yr. This includes self-supplied diversions of water used for extraction or production of oil, natural gas, gravel, water, or metals. It excludes diversions of water for mining of coal used for thermal electric power generation at the SJGS or FCPP, for which diversions are accounted under the power water use category for Upper Basin planning purposes. If in the future coal is extracted from within the region and transported to other states or regions, the water used to mine this coal would be accounted under the minerals or mining water use category.

6.1.7 Reservoir Evaporation:

The average annual amount of diversion into reservoir storage to replace reservoir evaporation losses in the San Juan River Basin in New Mexico is about 29,900 ac-ft/yr under current conditions. This includes:

- A long-term average annual amount of diversion into Navajo Reservoir storage to replace evaporation losses from the reservoir of about 27,900 ac-ft/yr, as calculated based on the USBR's San Juan River Basin hydrologic modeling prepared for the 2006 ROD on operations of Navajo Reservoir

- Diversion of 2,000 ac-ft/yr from scattered small reservoirs that store water for irrigation, recreation, or fish and wildlife purposes, as calculated based on average reservoir storage and surface area conditions as limited by available water supply.

The average reservoir diversion amount excludes evaporation losses from off-stream reservoirs that are filled from metered diversions that are included in other water uses. For example:

- Evaporation from Cutter Reservoir, which regulates irrigation water deliveries on the NIIP, is included in the NIIP's irrigation uses.
- Evaporation from Farmington Lake is included in the City of Farmington's municipal uses.
- Evaporation from Morgan Lake is included in the power generation uses at the FCPP.
- Evaporation from Heron Reservoir is replaced by SJCP exports (Heron Reservoir in the Rio Grande Basin regulates SJCP diversions for delivery to project contractors).

The Navajo Reservoir evaporation amount is based on average monthly net evaporation rates, which reflect reductions in physical evaporation from the reservoir surface for the salvage of evaporation and evapotranspiration losses that would have occurred within the reservoir pool area under pre-dam conditions, thus indicating the amount of net losses caused by filling of the reservoir.

6.1.8 Exports

Annual diversions from the San Juan River stream system in Colorado for export to the Rio Grande Basin in New Mexico for municipal, industrial, domestic and irrigation uses historically have ranged from about 6,300 to 174,900 acre-feet depending on (1) the streamflow available for diversion at the project's diversion structures and (2) storage conditions at Heron Reservoir, which after exportation regulates SJCP water deliveries. Based on an operation study for the SJCP prepared by the NMISC (Whipple, 2007), it is estimated that the long-term average annual diversion by the SJCP under existing conditions is about 105,200 ac-ft/yr. Also, in recent years the City of Gallup has diverted up to about 600 ac-ft/yr of groundwater from the southern end of the San Juan River Basin for export to help meet its municipal water demands.

6.1.9 Total Regional Historical and Present Uses

The total amount of diversion in the San Juan River Basin for uses in New Mexico under historical or current conditions averages about 879,000 ac-ft/yr including SJCP diversions for export to the Rio Grande Basin, or about 773,800 ac-ft/yr excluding the SJCP exports. The predominant water use in the San Juan Basin region under current conditions is for irrigated agriculture, and nearly all the water use in the region is supplied from surface water. The historical or current diversions for the San Juan Basin region are summarized by category of use

in Table 6-1 and Figure 6-1. (Note that Tribes and Pueblos in New Mexico are not required to provide water use data to the State; therefore, tribal water use data are not necessarily reflected in this plan.)

Table 6–1. Total Withdrawals in the San Juan Basin Water Planning Region in 2010

Use Category	Total Withdrawals[a] (acre-feet)
Public water supply / Domestic (self-supplied)	27,700
Irrigated agriculture	655,100
Livestock (self-supplied)	4,400
Industrial / Commercial (self-supplied)	400
Mining (self-supplied)	1,600
Power (self-supplied)	51,300
Reservoir evaporation	29,900
Exports	105,800
Total	876,200

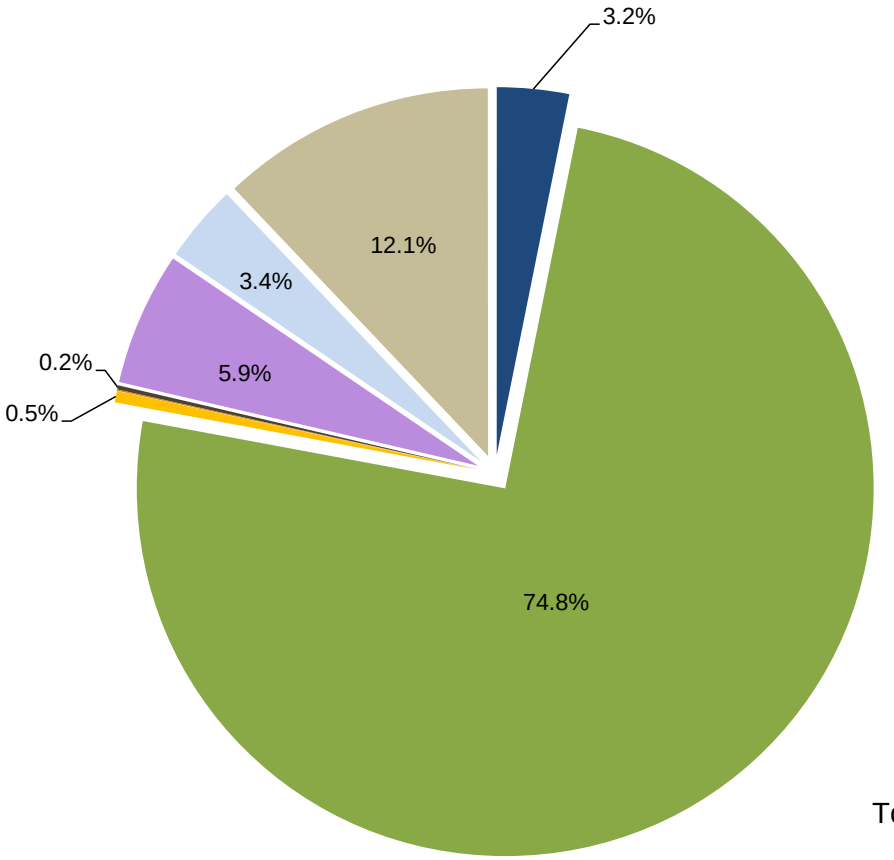
Source: Longworth et al., 2015

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

Less than 1 percent of the total withdrawals in the region are supplied by groundwater. Most of the groundwater use in the San Juan Basin region is for scattered uses, including domestic uses supplied from public water supply systems and self-supplied domestic uses. Groundwater also supplies some industrial and livestock watering uses. Groundwater points of diversion are shown in Figure 6-2.

In addition to diversions from the San Juan River stream system, streamflows in the river system are affected by unquantified additional categories of water use, including riparian evapotranspiration losses from stream channels and instream flow maintenance for fish and wildlife habitat.

- *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. Historical riparian evapotranspiration losses from the San Juan River stream system are reflected in the historical streamflow and available water supply. Possible changes in riparian evapotranspiration losses might be considered in future regional and state water plan updates.



Total usage: 876,200 acre-feet (diversions)

Explanation

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

Source: NMISC, 2015

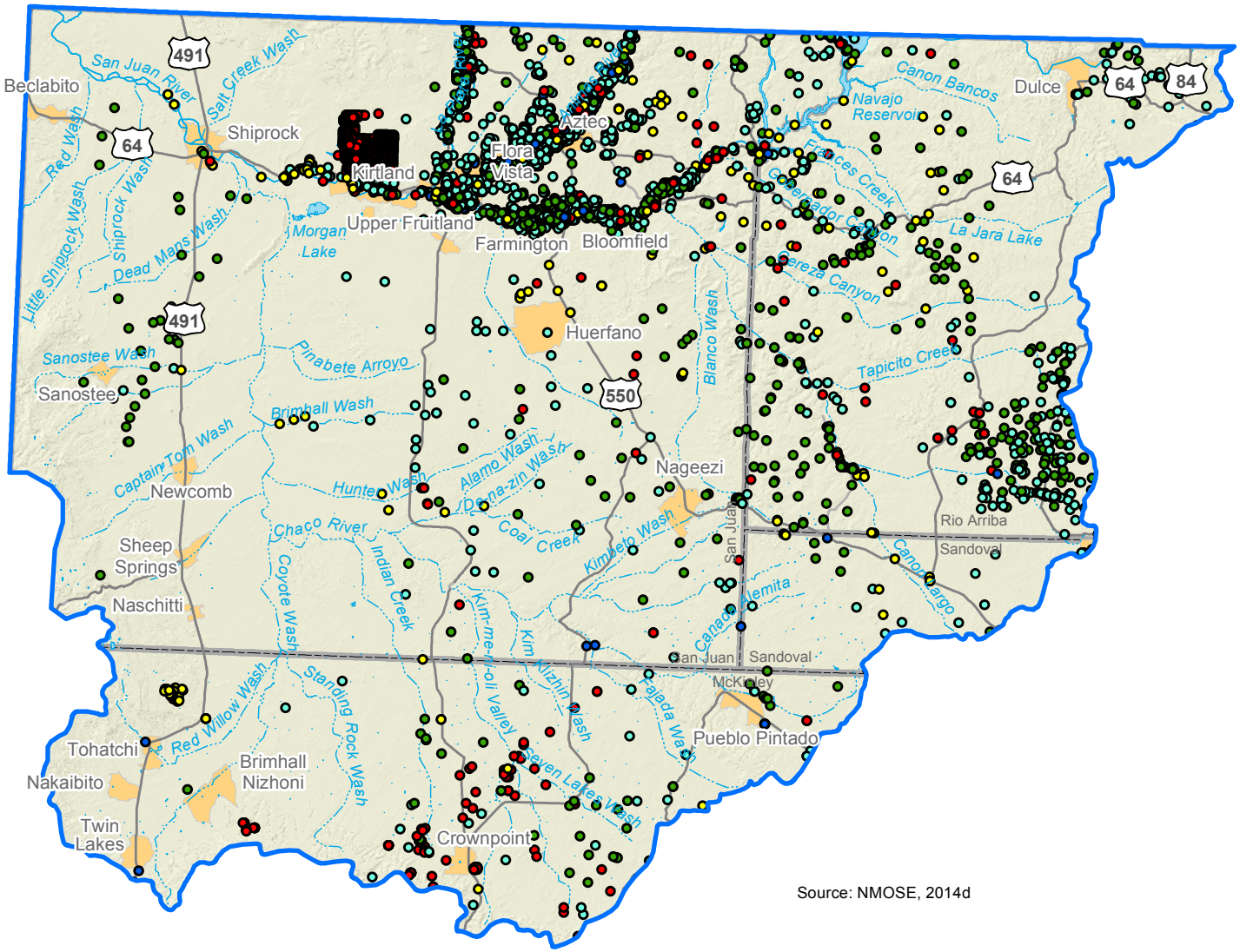
Notes:
1. Only categories with usage above 0.1% are shown.
2. Tribes and pueblos in New Mexico are not required to provide water use data to the State. Therefore, tribal water use data are not necessarily reflected in this figure.

Figure 6-1

SAN JUAN BASIN
REGIONAL WATER PLAN 2016

Total Regional Water Demand by Sector, 2010

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



N

0 9 18 Miles

Explanation

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

Well (use)

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

SAN JUAN BASIN
REGIONAL WATER PLAN 2016

Groundwater Points of Diversion

Figure 6-2

The New Mexico Water Resources Research Institute is currently developing riparian evapotranspiration 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:* It is recognized that there is value in preserving instream flow for ecosystem, fish and wildlife habitat, and tourism benefits. Water demands for instream flow in the San Juan Basin Water Planning Region were not quantified for this regional plan update. However, the 2006 ROD on Navajo Reservoir operations provides for operating the reservoir to meet water demands under Navajo Reservoir water supply contracts while also meeting the SJRBRIP's flow recommendations to provide adequate habitat for the conservation of endangered fish species in the San Juan River downstream of its confluence with the Animas River. The operation of Navajo Dam in accordance with the ROD allows for further development of the Navajo Reservoir supply consistent with existing contracts and the Endangered Species Act. It is possible under certain conditions that the SJRBRIP's flow recommendations for the San Juan River, or a reasonable alternative, might impair the ability of the Navajo Nation to fully utilize the NIIP for some period of time, in which case future water plan updates might consider any such gap between supply and demand for the NIIP. Until the NIIP and the NGWSP are fully developed and utilized, the ROD also allows flexibility in operating the reservoir to maximize, to the extent possible, benefits to the recreational trout fishery below Navajo Dam. Physical habitat improvements are also being made to the river channel below Navajo Dam for the benefit of the trout fishery.

Also, there is significant oil and gas development in the region, and produced water from oil and gas development is not included in the NMOSE water use by category report. Produced water is generally high in total dissolved solids and as part of the oil and gas extraction process is withdrawn from formations that are deeper than those that supply groundwater for beneficial use, such as domestic, livestock, irrigation, or industrial uses. Approximately 10 barrels of water are produced for every barrel of oil produced (Simpson, 2006). The produced water is generally treated and re-injected or discharged to the surface. Produced water is not considered to impact flow in the San Juan River, and it might not be an economically viable or significant part of the water supply available to meet future beneficial use demands in the region.

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, in addition to authorized water uses and water supply projects under construction or in other stages of development. As previously noted, the San Juan Region includes almost all of San Juan County and small portions of McKinley, Rio Arriba, and Sandoval counties. The 2013 population of San Juan County was 130,044 (U.S. Census Bureau, 2014a). A significant portion of the region lies within the Navajo Reservation.

As shown in Table 3-1, San Juan and Sandoval counties experienced a high rate of population growth from 2000 to 2010, while McKinley and Rio Arriba counties experienced declines. Since 2010, there have been declines in San Juan and Rio Arriba counties and growth in McKinley and Sandoval.

The largest employment categories in the region are education/healthcare, mining, agriculture, and forestry, retail trade, tourism-related services (arts, entertainment, recreation, hospitality, and food services), transportation and utilities, construction, and professional and scientific services. Agriculture is the largest water user in San Juan County, followed by power generation, reservoir evaporation, and municipal and domestic use.

The San Juan Region includes virtually all of San Juan County, which constitutes the Farmington Metropolitan Statistical Area (MSA). The Farmington MSA is the major wholesale and retail trade center for northwest New Mexico and southwest Colorado. It also contains much of the state's mining and power production and the San Juan oil and gas basin.

As noted in Table 3-1d, vegetables, melons, and potatoes are the most valuable agricultural commodities in San Juan County. Other crops and hay and livestock are also important.

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

6.2.1 San Juan County

The City of Farmington comprises over one-third of the population of San Juan County. Other significant incorporated communities are Aztec and Bloomfield. San Juan County experienced steady growth from 1950 to 2010, with the population increasing from 18,292 in 1950 to 53,306 in 1960, 81,433 in 1980, and 130,044 in 2010. Although growth was relatively steady overall, it

did experience some fluctuations due to a series of booms and busts in the coal, uranium, and oil and gas industries. Since 2010, there has been considerable out-migration from San Juan County, with the population in 2013 estimated to be 126,503, down from 130,044 in 2010 (U.S. Census Bureau, 2014a).

The Arrowhead Center at New Mexico State University (NMSU) analyzed the economy of San Juan County and identified the basic industries that support the economy (Arrowhead Center, 2013). Basic industries bring outside dollars into the economy. A basic industry frequently has a location quotient (LQ) greater than 1.0, which means that its relative share of the local economy is greater than that industry's relative share of the state economy. In San Juan County, the primary basic industries in 2011 were mining (LQ of 4.16) and utilities (LQ of 3.84). There were 7,662 jobs in mining (which includes oil and gas extraction) and 1,031 jobs in utilities, mostly related to power generation at the FCPP and the SJGS). Other basic industries were agriculture (LQ of 1.31), wholesale trade (LQ of 1.26), retail trade (LQ of 1.11), and transportation and warehousing (LQ of 1.10).

After mining, the largest private employment sector was retail trade with 7,325 employees. Wage and salary employment overall has increased slightly during the past three years, from 50,171 in 2010 to 51,704 in 2013.

The region's dependence on mining has led to a series of boom and bust cycles. With the recent decline in natural gas prices, there has been a decline in natural gas drilling activity. Gas volumes in San Juan County have declined from roughly 650 million cubic feet in 2004 to just over 400 million cubic feet in 2013. At the same time, the use of horizontal hydraulic fracturing has led to an increase in oil drilling, particularly in the Mancos Shale formation in the eastern portion of the region. Oil production has increased from about 1,100,000 barrels in 2011 to more than 1,500,000 barrels in 2013. It is estimated that there are 30 billion barrels of shale oil (not all of which is recoverable) in the San Juan Basin (NMDOT, 2014). About 200 new wells are being drilled per year in the Mancos formation, and this number is expected to increase. Coal mining in the region is expected to decline due to the retirement of three coal-fired generation units at the FCPP at the end of 2013 and the anticipated replacement of two coal-fired generation units at the SJGS with gas-fired units by the end of 2017. However, power generation projects such as the proposed Desert Rock Power Plant possibly could develop new coal-fired generation units if pursued in the future, or demand for coal also could increase if a proposed rail line from Farmington to Gallup is constructed and makes feasible the export of coal from San Juan County to other regions or states.

The New Mexico Department of Workforce Solutions (2014) has projected employment growth for the Farmington MSA (San Juan County) from 2010 to 2020. It is projected that 8,650 new jobs will be created, for a gain of 16.8 percent. The largest job gains are projected in the following sectors:

- Health care and social assistance: 1,760
- Mining: 1,360
- Educational services: 1,230
- Retail trade: 1,060
- Accommodation and food services: 990

Despite the recent out-migration, there are some bright spots on the economic horizon accompanying the growth in oil production. Several developers are working on the west side of Farmington, where more than 1,000 housing units are planned over the next couple of years. Additional restaurants and retail are being built in the county.

Several industries are being targeted by 4CED Inc. (formerly San Juan Economic Development Service). These include agriculture, oil and gas, and manufacturing. The New Mexico Legislative Job Council (2013) has targeted "integrated IT and cyber," as well as manufacturing and extractives, in the Northwest District of New Mexico (which includes San Juan County). It is projected that 16,500 jobs could be created in these three sectors during the next ten years if limitations in broadband, transportation, workforce quality, leadership, and tax and regulatory areas could be overcome. A feasibility study has been funded to explore building a rail line from Farmington to Thoreau or Gallup. This would allow for the export of coal, crude oil, fly ash, agricultural products, and manufactured goods, which could significantly impact the region's economy. The rail line is also being addressed in the 2040 Statewide Multi-Modal Transportation Plan (NMDOT, 2014). Such a line would allow for the import of fertilizer, oil field supplies, and other products, as well as the export of goods.

The largest agricultural enterprise in San Juan County is the Navajo Agricultural Products Industry (NAPI), which manages the NIIP. The NIIP is authorized for build out to irrigate up to 110,630 acres south of Farmington, but completion of the project will not likely occur until about 2040 given current rates of annual federal appropriations for project construction. The NIIP diverts water from Navajo Reservoir, and the annual diversion demand for the NIIP is anticipated to average about 353,000 ac-ft/yr. Major crops supplied by water from the NIIP are potatoes, corn, alfalfa, beans, hay, barley, wheat, and oats. Potatoes are shipped to a Frito-Lay plant in Texas, wheat is shipped to southern Arizona, and much of the hay is used for feed within New Mexico. Potatoes in future years may be processed by NAPI in New Mexico as it has planned for development of a french fry processing facility on the NIIP and the NGWSP includes water for use at the planned facility.

According to the Census of Agriculture, the most valuable agricultural commodities in San Juan County are vegetables, melons, and potatoes. Other crops and hay, livestock, and wool are also important (USDA NASS, 2014). The number of farms and ranches increased by 39 percent, from 1,897 in 2007 to 2,628 in 2012. The average farm size also increased, from 860 acres to

982 acres in 2012. Between 2007 and 2012 irrigated acreage increased from 78,438 acres to 85,890 acres, a gain of 9.5 percent, due to increased build-out at NIIP.

In 2012, the average payment to a farmer participating in agricultural support programs was $2,787, down 73 percent from 2007, with a total of $1,023,000 in government payments going to farmers in San Juan County, an increase of 14 percent from the $900,000 distributed in 2007. The average farm had a net cash operating loss of $247. The average age of a farmer in 2012 was 60.5.

The majority of farms in the county are less than 15 acres in size, family-owned, and located on the Navajo Reservation. Sheep and beef cattle comprise the largest livestock categories. Alfalfa is the main crop in terms of acreage. In recent years, there have been few sales of agricultural land.

6.2.2 Rio Arriba County

The western portion of Rio Arriba County is included within the San Juan Region. It is a rural area that is partially located on the Jicarilla Apache Reservations. A considerable amount of oil and gas drilling takes place in this portion of the county. In 2010 the portion of the county within the planning region had a population of 3,889.

6.2.3 McKinley County

The northern portion of McKinley County is included within the San Juan Region. It is a rural area that is largely on the Navajo Reservation. In 2010 it had a population of 11,396.

6.2.4 Sandoval County

The San Juan Region includes the far northwestern portion of Sandoval County. It is a rural area that includes some oil and gas drilling. The portion of Sandoval County in the San Juan planning region had a population of 1,032 in 2010.

6.3 Projected Population Growth

The 2003RWP (SJWC, 2003) provided a single population projection for the planning horizon through 2044. The forecast was based on an average of linear and exponential regressions of historical population data. An increase in the regional population was projected, from 97,028 in 2000 to 202,150 in 2044. This is equivalent to a compound annual growth rate of 1.68 percent.

Since 2008, the drought, lower natural gas prices, and the national recession that started in 2007 have resulted in slower population growth in San Juan County than was anticipated. The BBER has continued to revise population projections downward to reflect the slower growth (BBER, 2012; 2008).

Persons who were interviewed for this project were, on the whole, somewhat pessimistic about the near-term future of the region's economy. In the longer term, it appears that the economy will recover and grow, especially if the boom in oil production is realized.

Population projections through 2020 were developed by Trib Choudhary, formerly the demographer for the Navajo Nation. Mr. Choudhary optimistically projected that annual growth will average approximately 2 percent throughout the Reservation.

For the population projections through 2060 (Table 6-3), 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. All the projections are for those portions of the counties within the San Juan Basin region.

The high projection for the portion of San Juan County in the planning region was based on the population forecasts currently being updated by the SJWC. The high population projections for the three partial counties were based on the BBER forecasts for water planning provided to the Interstate Stream Commission in 2008. Under the high forecast, by 2060 population within the region will reach 313,900 in San Juan County, 16,326 in McKinley County, 5,966 in Rio Arriba County, and 2,014 in Sandoval County.

The current (2012) BBER population projections through 2040 (Appendix 6-B) were used as a starting point for the low population projection for San Juan County, extrapolated through 2060, except that they were dampened for the 2010 to 2020 period to take into account the slower rate of growth that has actually occurred since 2010. For the other three counties, the low forecasts were for annual growth at half of the rate projected by BBER in 2008 (which was used as the high projections), except that, as with San Juan County, no growth was projected for the period 2010 through 2020. Under the low forecast, the population of the partial counties in 2060 will reach 177,057 in San Juan County, 13,001 in McKinley, 4,472 in Rio Arriba, and 1,295 in Sandoval. The population projections are detailed in Table 6-3.

6.4 Water Conservation

Water conservation is often a cost-effective and easily implementable measure that a region may use to help balance supplies with demands. The cost-effectiveness of certain water conservation measures may depend on the specific physical, legal, and financial issues affecting water diversion and storage, water treatment, and water delivery. 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

Table 6–3. San Juan Basin 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
San Juan	High	1.81	1.75	1.74	1.78	1.85
	Low	0.00	0.99	0.83	0.70	0.60
Rio Arriba	High	1.50	0.82	0.90	0.60	0.48
	Low	0.00	0.41	0.45	0.30	0.24
McKinley	High	0.99	0.74	0.67	0.64	0.57
	Low	0.00	0.37	0.34	0.32	0.29
Sandoval	High	2.20	1.64	1.21	0.92	0.77
	Low	0.00	0.82	0.61	0.46	0.39

Source: Poster Enterprises, 2014

b. Projected Population

County	Projection	Population					
		2010	2020	2030	2040	2050	2060
San Juan	High	129,634	155,090	184,431	219,214	261,416	313,900
	Low	129,634	129,634	143,116	155,567	166,783	177,057
Rio Arriba	High	3,889	4,513	4,897	5,357	5,687	5,966
	Low	3,889	3,889	4,052	4,238	4,366	4,472
McKinley	High	11,396	12,575	13,538	14,472	15,424	16,326
	Low	11,396	11,396	11,824	12,232	12,630	13,001
Sandoval	High	1,032	1,283	1,509	1,702	1,865	2,014
	Low	1,032	1,032	1,120	1,190	1,246	1,295

Source: Poster Enterprises, 2014

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 San Juan Basin region, as identified by the regional steering committee, are provided in Section 8.

Public water supply. In theory, public water suppliers that have large per capita water usage rates may have a greater potential for water conservation than those that have low per capita usage rates; however, this is not necessarily an indication that those with low per capita usage rates are using water more efficiently. For example, the City of Farmington's high average per capita usage rate is due in part to the following conditions

- The City has a significant amount of bulk raw water sales for commercial irrigation uses (for example, at golf courses) and the sold raw water is accounted under its municipal use water rights.
- Farmington delivers water diverted through its municipal water system to its APP and BVPP for use in gas-fired thermal electric power generation, and this water use is counted under its municipal use rights.
- The City has a high hotel and motel occupancy rate as compared to the population, which results in a comparatively higher per capita usage rate calculated using only its resident population.
- The amount of reservoir evaporation from Farmington Lake, the City's municipal water supply reservoir, is relatively significant.

Annual fluctuations in the City's per capita use also occur due to changes each year in the net amount of water diverted into storage or withdrawn from storage at Farmington Lake for municipal use (the lake is located downstream of the points where the City's diversions are metered).

On the other hand, IHS or NTUA public water systems on the Navajo Reservation within the region currently have low per capita usage rates in part because they (1) have limited well yields and groundwater supply available for sustained use and (2) supply both households connected to the water systems and those who haul water from system watering stations to their homes for use.

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 in 2010 that are shown in Table 6-4.

The system-wide per capita usage for each water supplier may include uses such as irrigation of golf courses and parks, reservoir evaporation, uses at hotels and motels, industrial uses, and commercial enterprises that are supplied by the system. Hence there can be large variability among the systems.

Considering that water supply from the San Juan and Animas rivers and water rights held by public water providers are not limiting factors to municipal or domestic water uses in the region within a reasonable planning horizon, it is assumed that there is little pressure on public water providers to implement substantial water conservation measures within the next few decades. Thus, while updates to other regional water plans may assume that water conservation targets are met in projecting future municipal or domestic water uses, this water plan update does not do so.

Another target or criterion if applied to this region would assume that per capita usage rates for Navajo Nation municipal or domestic uses would not change from current rates; however, planning reports for the NGWSP assume that Navajo Nation per capita usage rates will significantly increase to as much as 160 gpcd once the project is delivering a renewable water supply to communities throughout the Navajo Reservation, IHS and NTUA public water systems are expanded to reduce water hauling, and residents have adequate water supplies to irrigate a yard or garden and have certain amenities such as a washing machine that come with an improved standard of living. Thus, although municipal or domestic water providers in the region should routinely explore water conservation measures to evaluate if and when they might be cost-effective to implement, implementation of water conservation was not explicitly considered in the development of water use projections for the San Juan Basin region. This is a conservative approach for planning purposes.

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.

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.

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
San Juan County					
San Juan	Aztec	7,084	198	1,572	0
	Blanco Water Association	1,260	71	61	40
	Bloomfield Water Supply System	7,500	166	1,391	0
	Shiprock--NTUA [c]	8,156	60	552	0
	Southside WUA	1,593	53	69	25
	Farmington Water System	45,877	245	12,580	0
	Flora Vista WUA	4,291	58	23	255
	Harvest Gold Subdivision	522	51	30	0
	La Vida Mission Community Water Supply	28	414		13
	Lee Acres WUA	5,078	87	494	0
	Lower Valley WUA	9,548	112	1,197	0
	Morningstar WUA	5,950	76	506	0
	Navajo Dam MDWCA	592	42	0	28
	North Star WUA	3,864	67	289	0
	Rosa Joint Venture	200	70	0	16
	Upper La Plata WUA	2,524	63	179	0
	West Hammond MDWCA	4,172	71	332	0
San Juan County public water supply totals		108,239		19,275	376
County-wide public water supply per capita use [d]			162		

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

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

gpcd = Gallons per capita per day

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

OSE Declared Groundwater Basin(s) [a]	Water Supplier [b]	Population	Per Capita Use (gpcd)	Withdrawals (acre-feet)	
				Surface Water	Groundwater
San Juan County (cont.)					
San Juan	Rural self-supplied homes (San Juan)	21,805	70	0	1,710
	San Juan County domestic self-supplied totals	21,805		0	1,710
	County-wide domestic self-supplied per capita use [d]		70		
Rio Arriba County					
San Juan	Dulce--BIA, Jicarilla Agency [c]	3,280	157	578	0
	Lindrith Community Water Co-Op	130	64	0	9
	Lumberton WUA	240	60	16	0
	Lybrook WUA	400	147	0	66
	Rio Arriba County public water supply totals	4,050		594	75
	County-wide public water supply per capita use [d]		148		
San Juan	Rural self-supplied homes (San Juan)	483	80	0	43
	Rio Arriba County domestic self-supplied totals	483		0	43
	County-wide domestic self-supplied per capita use [d]		80		
McKinley County					
San Juan	Rural self-supplied homes (San Juan)	12,634	70	0	991
	McKinley County domestic self-supplied totals	12,634		0	991
	County-wide domestic self-supplied per capita use [d]		70		
Sandoval County					
San Juan	Rural self-supplied homes (San Juan)	2,219	80	0	199
	Sandoval County domestic self-supplied totals	2,219		0	199
	County-wide domestic self-supplied per capita use [d]		80		

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

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

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

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

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

gpcd = Gallons per capita per day

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 San Juan Basin steering committee to achieve savings in agricultural water use within the region.

Self-supplied commercial, industrial, livestock, and mining. Conservation programs can be applicable to these sectors, but since uses are low in these categories within the region, no additional conservation savings are assumed in the water demand projections.

Power. The power sector may benefit from additional conservation measures in San Juan County, but no quantitative projections of conservation savings have been included.

Reservoir evaporation. Reservoir evaporation is the third highest water use in the San Juan Basin region. Some areas outside of the region have considered aquifer storage and recovery as a means to replace reservoir storage and reduce reservoir evaporation losses. It may also be possible in some circumstances to gain a reduction in evaporation by storing more water at higher elevations that tend to experience cooler temperatures and consequently lower evaporation rates, on average, or by constructing deeper reservoirs with less surface area from which evaporation might occur. However, due to the legal, financial, and other complexities of implementing these techniques, no conservation savings are assumed in developing the reservoir evaporation demand projections for this region.

6.5 Projections of Future Water Demand for the Planning Horizon

Water use projections for each category of use were made for 10-year intervals beginning with 2020 and ending with 2060 (Table 6-5). To assist in bracketing the uncertainty of the projections, low water use and high water use estimates were developed for each category. For a high water use scenario, diversion demand projections for the San Juan Basin Water Planning Region generally were made considering:

- Historical and current diversion demands in the region through 2014
- The 2006 State of New Mexico Schedule of Anticipated Upper Basin Depletions (USBR, 2007; Whipple, 2010)
- Full development of authorized water uses, including the ALP, the NGWSP, File No. 2883 litigation settlement allocations for non-project uses, and Indian reserved water rights
- Population growth projections for the region
- Additional information currently available relating to future uses.

For a low water use scenario, diversion demand projections for the region were made considering also delays in developing uses under these water projects.

The San Juan Basin region generally did not incorporate the methodology described in the *Updated Regional Water Planning Handbook* (NMISC, 2013) for projecting water uses because much of the methodology was not applicable to this region and did not adequately address

Table 6-5. Projected Water Demand, 2020 through 2060 San Juan Water Planning Region

Use Sector	Projection	Water Demand [a,b] (acre-feet)					
		2010	2020	2030	2040	2050	2060
Total region							
Public water supply / Domestic (self-supplied)	High	27,700	40,100	53,200	64,600	75,800	88,800
	Low	27,700	32,900	38,800	43,500	47,900	52,900
Irrigated agriculture	High	655,100	714,500	764,500	814,500	814,500	814,500
	Low	655,100	509,700	547,700	585,200	585,200	585,200
Livestock (self-supplied)	High	4,400	4,400	4,400	4,400	4,400	4,400
	Low	4,400	4,400	4,400	4,400	4,400	4,400
Industrial / Commercial (self-supplied)	High	400	700	700	700	700	700
	Low	400	400	400	400	400	400
Mining	High	1,600	2,300	2,300	2,300	2,300	2,300
	Low	1,600	1,600	1,600	1,600	1,600	1,600
Power (self-supplied)	High	51,300	61,000	61,000	61,000	61,000	61,000
	Low	51,300	42,500	42,500	42,500	42,500	42,500
Reservoir evaporation	High	29,900	29,900	29,900	29,900	29,900	29,900
	Low	29,900	29,900	29,900	29,900	29,900	29,900
Exports	High	105,800	105,800	116,800	120,900	120,900	120,900
	Low	105,800	105,800	113,300	117,200	118,300	119,500
Total regional demand	High	876,200	958,700	1,032,800	1,098,300	1,109,500	1,122,500
	Low	876,200	727,200	778,600	824,700	830,200	836,400

Source: Longworth et al., 2015

[a] Projected diversions. Overall, the consumptive use of water is much less than the amount of diversion as there is a substantial amount of return flow to the San Juan River stream system from irrigation, municipal, and domestic water uses in the basin.

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

(1) available reservoir storage, (2) authorized full development of federal water supply projects, (3) actual diversion practices and reservoir operations on the San Juan and Animas rivers, (4) water apportionments made by the Colorado River and Upper Colorado River Basin compacts, (5) average annual diversions for water use demands that vary considerably from year to year, as compared to annual diversion amounts in 2010, and (6) other water use or water rights considerations.

Specific assumptions and methods used to project future diversion demands in the San Juan Basin Water Planning Region are as follows for each category of use. The resultant projected future amounts of diversion in the region for each category of use through the 2060 planning horizon are discussed in Sections 6.5.1 through 6.5.9.

6.5.1 Irrigation

Under full build-out and development of the NIIP to irrigate up to 110,630 acres of land as authorized by Public Law 87-483, the average annual diversion demand for the NIIP was estimated in the 1999 NIIP Biological Assessment to range from a low of about 337,500 ac-ft/yr, assuming that planned water management changes and water conservation measures for the project are implemented and fully effective, to a high of about 372,000 ac-ft/yr, assuming no effective water conservation (KBE and ERI, 1999). The Biological Assessment also anticipated that construction of the project would be completed by the end of 2032; however, based on recent low levels of annual federal appropriations for project construction and current needs to refurbish existing sprinkler systems on the project, it is assumed that completion of the NIIP now will not occur until about 2040.

For the Fruitland and Hogback irrigation projects, the Navajo Decree adjudicated to the Navajo Nation rights to divert at rates of up to 100 cfs and 221 cfs, respectively. If the current NMOSE administration practice of not limiting annual irrigation diversions to project diversion requirements (PDR) continues, the Navajo Nation in the future might divert up to 321 cfs throughout the irrigation season, assuming that rehabilitation of the Fruitland Project does not allow irrigation needs to be met with diversion rates of less than 100 cfs. For both projects combined this irrigation rate is equivalent to about 136,300 ac-ft/yr. If future NMOSE administration of irrigation diversions from the San Juan River limits annual diversions to the PDR, then under the Navajo Decree the Navajo Nation might be limited to annual diversion amounts of 18,180 ac-ft/yr for the Fruitland Project and 48,550 ac-ft/yr for the Hogback Project, or about 66,700 ac-ft/yr for both projects combined. Rehabilitation of the Fruitland and Hogback projects is expected to be completed by 2020. To be conservative for planning purposes, it was assumed for both the low water use and high water use scenarios that the NIIP and the Fruitland and Hogback projects are fully utilized.

For Navajo ephemeral tributary irrigation uses, the high water use scenario assumes that the historical diversion demand quantified for this regional water plan continues throughout the

planning horizon, and the low water use scenario assumes that about half the amount of acres that could be irrigated under the Navajo Nation ephemeral tributary irrigation water rights might not be available for use in any year due to lack of adequate rehabilitation and maintenance of historical Navajo irrigation projects and lands. The amount of acres currently irrigated on Navajo lands by diversions from ephemeral tributaries is less than the amount of acres that were historically developed and irrigated and for which water rights to the Navajo Nation were adjudicated under the Navajo Supplemental Decree; however, to be conservative for planning purposes, it was assumed that historical Navajo irrigation projects and lands will be rehabilitated to allow the Navajo Nation to better utilize its decreed diversion rights for these uses. The annual diversions for Navajo irrigation uses from ephemeral tributaries amount to about 2 percent or less of total irrigation diversions in the San Juan Basin region, and have little effect on San Juan River flows below Shiprock and no effect on river flows above Shiprock.

Future annual diversions for non-Navajo irrigation uses are anticipated to continue to total about 291,900 ac-ft/yr based on recent non-Navajo irrigation diversions and assuming the continuation of the current NMOSE administration practice of not limiting annual irrigation diversions under water rights adjudicated by the Echo Ditch Decree to the PDR. If future NMOSE administration of irrigation diversions from the San Juan River limits annual diversions to the PDR, then the total annual amount of diversion for all non-Navajo irrigation uses combined might be limited in the future to about 174,000 ac-ft/yr. This amount of irrigation diversion for the low water use scenario was calculated considering:

- The number of acres under each ditch with decreed or licensed irrigation rights from the San Juan River or its tributaries, excluding La Plata River, and the per-acre PDR rates for these ditches provided in the 1938 State Engineer Hydrographic Survey report for the San Juan River stream system, without adjustments to the PDR rates for current evaluation methodologies and cropping patterns

- The annual diversion amounts provided by licenses or permits for the Hammond Irrigation Project

- Diversion rights adjudicated to the Jicarilla Apache Nation in the San Juan River Adjudication for irrigation uses

- The estimated average annual diversion for irrigation uses from La Plata River under current conditions

- An estimate of the possible reduction in the total annual PDR for irrigation rights that have been transferred to municipal, domestic, industrial, or commercial uses.

To be conservative for planning purposes, it was assumed that the remaining non-Indian irrigation water rights that were used historically but are associated with lands that have not been

irrigated in recent years would be available for future use for irrigation or other purposes. The diversion demand projections did not speculate regarding possible future transfers of irrigation rights to other uses.

The consequent range for the total annual irrigation diversions in the San Juan River Basin in the future between the low water use and high water use scenarios is about 585,200 ac-ft/yr to about 814,500 ac-ft/yr beginning about 2040. This range is believed to bracket possible future diversion amounts that might occur depending on the adjudication of irrigation rights in the San Juan River Adjudication and the promulgation of rules and regulations for AWRM in the basin, and assuming that the Navajo irrigation projects are fully developed as authorized and as provided for by the Navajo Nation's water rights for the projects. This range excludes diversions made by the SJCP and exported for irrigation uses in the Rio Grande Basin.

6.5.2 Livestock

Recent or current diversions in the San Juan River Basin for livestock uses, including stock watering and stock pond evaporation, were based on the water rights for stock watering uses and stock ponds that were adjudicated to the Navajo Nation by the Navajo Supplemental Decree, data on county livestock counts from the New Mexico Agricultural Statistics reports published by the New Mexico State University Agricultural Extension Service, and data on stock ponds provided by federal agencies involved in approving, funding, or constructing stock ponds in the basin. It is believed that approximately 70 percent of the total livestock use in the basin occurs on Navajo lands. The Navajo Nation's water rights for stock ponds are based on a 2012 hydrographic survey of existing stock ponds, and their water rights for stock watering were based on estimated peak annual animal units on Navajo Nation lands since the mid-1970s (Whipple, 2012).

Livestock uses at the NAPI feedlot on the NIIP are supplied from and accounted within the diversions for the NIIP. Based on NMISC five-year reports of consumptive uses and losses in the Upper Colorado River Basin in New Mexico and on periodic NMOSE water use by county reports prepared beginning the mid-1970s , the total annual amount of livestock use in the basin has not significantly changed from the mid-1970s to the present. Therefore, it is assumed that total livestock use in the basin is likely to remain near recent levels at about 4,400 ac-ft/yr under both the low water use and high water use scenarios.

6.5.3 Municipal/Domestic

Future municipal and domestic water uses include new uses under the authorized ALP and NGWSP water allocations, File No. 2883 litigation settlement allocations, and reserved water rights of the Navajo Nation and Jicarilla Apache Nation. The development of future diversion projections for municipal and domestic uses under the high water use scenario was based on the following:

- Projections of future water demands for non-Indian municipal and domestic public water providers and for the Jicarilla Apache Nation through 2060 that were included in the 2003 San Juan Hydrologic Unit Regional Water Plan (SJWC, 2003)

- Projections of future demands for water from the ALP and the NGWSP and groundwater for Navajo Nation municipal and domestic uses that were included in the 2001 NGWSP Technical Memorandum (Navajo Nation DWR et al., 2001)

- Projected future populations in the San Juan Basin region under the high growth rate scenario that were prepared in 2014 by Poster Enterprises for use in updating the 2003 RWP (Table 6-3)

- Existing water rights, including those pursuant to transfers of irrigation rights to municipal or domestic use, and water allocations under federal water projects for municipal or domestic uses

- Projected future depletions for municipal and domestic uses under federal water projects included in the 2006 State of New Mexico Schedule of Anticipated Upper Basin Depletions (USBR, 2007; Whipple, 2010).

The methodology for water uses based on these information sources is described in the following subsections.

6.5.3.1 Non-Indian Uses

The projected total diversions for non-Indian municipal and industrial uses by the cities of Farmington, Aztec, and Bloomfield and for non-Indian domestic uses supplied by other public water providers combined were obtained from the 2003 RWP for the period 2020-2060. The resultant total diversion for non-Indian municipal and domestic uses supplied from public water systems for 2060 was about 147 percent greater than that for 2010. This possible increase in diversions could include water for development by the City of Farmington of additional gas-fired power generation units at the BVPP or elsewhere (the City may close the gas-fired APP and either double the size of the BVPP or add an equivalent gas-fired unit by 2020). In comparison, the population projections for San Juan County made for this RWP update by Poster Enterprises in 2014 (Table 6-3) indicated that under a high population growth scenario the county combined non-Indian and Navajo population by 2060 might be about 142 percent greater than that in 2010.

6.5.3.2 Navajo Nation Uses

Projected total diversions for Navajo Nation municipal and domestic uses were determined from the projected uses of water by the ALP, the NGWSP, and ground water for 2040 by chapter or other geographic area as presented in the 2001 NGWSP Technical Memorandum (Navajo Nation DWR et al., 2001), which assumed a significantly higher rate of population growth on the

Navajo Reservation through 2040 than the future high population growth rates for each county in the San Juan Basin region developed for this RWP update (Table 6-3).

- *Projections for 2020 to 2040:* For diversion demands prior to 2040, the following was considered:
    - The NGWSP's Cutter Lateral is scheduled to be completed by the end of 2017, after which the Navajo Nation may begin delivering project water to chapters on the Navajo Indian Reservation along the U.S. Highway 550 corridor.
    - The NGWSP's San Juan River pipeline is scheduled to be completed by the end of 2024, after which the Navajo Nation may begin delivering project water to chapters along the San Juan River valley and along the U.S. Highway 491 corridor.
    - The NGWSP pipelines will connect to existing local NTUA or IHS public water supply systems that serve Navajo communities, and these systems will need to be extended to fully develop the Navajo Nation's project water allocation by 2040.

  The pre-2040 growth in NGWSP diversions for uses in the basin, including groundwater diversions but excluding NAPI industrial use and exports, is due to population growth on the Navajo Reservation within the basin that is anticipated by the Navajo Nation, expanded service areas for delivery and use of San Juan River water, increases in per-capita usage rates associated with a renewal water supply, an improved standard of living, and reduced water hauling. Much of the local aquifer sustained yield has been developed by existing NTUA or IHS public water supply systems and is included in the scattered rural domestic use subcategory.

- *Projections for 2040 to 2060:* The Navajo diversion demands for municipal or domestic water uses in the San Juan River Basin in New Mexico for 2050 and 2060, excluding NAPI industrial uses under the NGWSP and NGWSP exports for uses in other basins, were extrapolated from the projected diversion demand for the uses in the basin in 2040 using the same percentage increases in demand during each respective decade as was used for non-Indian municipal and domestic uses in the basin in the 2003 RWP. The 2001 Technical Memorandum (Navajo Nation DWR et al., 2001) estimated that local aquifer sustained yields at various locations in the basin total about 2,400 ac-ft/yr, and this amount of groundwater use was subtracted to calculate the resultant Navajo municipal and domestic water demands from the San Juan River stream system for 2040-2060.

6.5.3.3 Jicarilla Apache Nation Uses

Projected total diversions for Jicarilla Apache Nation municipal and domestic uses, exclusive of uses in the Rio Grande Basin under its SJCP water allocation, were determined for the period 2020-2060 in two parts:

- Total water demand projections for municipal and domestic uses on the Jicarilla Reservation based on anticipated population growth were presented in the 2003 RWP, with much of this use being provided by the Dulce water system within the northern portion of the reservation in Rio Arriba County.

- Development of the Jicarilla Apache Nation's NGWSP uses for domestic and commercial purposes in the southern portion of the reservation was assumed to begin prior to 2030 and be completed by 2060. The Jicarilla Apache Nation is responsible for constructing the infrastructure to deliver water from the NGWSP's Cutter Lateral to the place or places of use.

The population-based annual diversion demand for the Jicarilla Apache Nation in the San Juan Basin region, excluding NGWSP deliveries, that was projected for 2060 is about 86 percent greater than that for 2010. In comparison, the population projections for Rio Arriba and Sandoval counties made by Poster Enterprises in 2014 (Table 6-3) indicated that the populations in these counties by 2060 might be about 53 percent and 95 percent greater, respectively, than those in 2010.

6.5.3.4 Rural Domestic Uses

Groundwater diversions for scattered rural domestic uses, which include uses supplied from groundwater by public water providers such as NTUA and IHS or by self-supplied domestic wells, were assumed to increase by less than 10 percent between 2010 and 2060. The NTUA and IHS water systems on the Navajo Reservation are expected to serve additional customers over time through both population growth and expansion of their local water systems, thus reducing both water hauling and self-supplied domestic well use. There is little sustained yield from groundwater of suitable quality for domestic use that remains to be developed by the Navajo Nation from local aquifers currently tapped by community wells, and it is assumed that most growth in population and domestic water use will occur in areas served from surface water diversions by public water providers. Annexation of lands by cities and regionalization of municipal water systems may also result in reduced self-supplied domestic well use as rural areas connect to available public water systems.

6.5.3.5 Total Regional Municipal//Domestic Uses

Based on the above approach, and on coordinating federal water project diversion projections with depletion projections for them, the future total amount of diversion for municipal and domestic uses in the San Juan River Basin in New Mexico was projected to approach about 88,800 ac-ft/yr by 2060 under the high water use scenario. While a portion of the water rights for municipal or domestic uses might be used in the future for otherwise self-supplied industrial or commercial purposes instead, this assumption accounts for the effects that such possible transfers might have on the total diversion demand in the San Juan River Basin in New Mexico. This is a conservative assumption for planning purposes that reflects (1) the amount of water use

for which water rights may be licensed or adjudicated and (2) water rights that may be exercised in the future for municipal or domestic use, or that might be acquired and possibly transferred for other uses. Under the high water use scenario, the ALP and NGWSP water allocations and uses in New Mexico would be fully developed within the 2060 planning horizon.

Projected future diversions for municipal and domestic uses in the San Juan Basin region under the low water use scenario were based on the 2014 Poster Enterprises population projections for San Juan County, which indicated that the county population by 2060 might be only about 37 percent greater than the county population was in 2010 under a low population growth scenario. The projected total diversions in 2060 for both non-Indian and Navajo Nation municipal and domestic uses supplied from surface water diversions made by public water supply systems under the low water use scenario thus were calculated as about 55 percent of the projected amounts of river diversion for these uses by 2060 under the high water use scenario. This percentage reflects the ratio of the San Juan County total population growth factor for 2010-2060 under the low population growth scenario to the total increase in the respective non-Indian and Navajo Nation municipal and domestic diversions from surface water under the high water use scenario (1.37/2.47=0.55) and includes diversions from the San Juan River, including Navajo Reservoir, and the Animas River, and exclude scattered domestic groundwater uses that are assumed under the low water use scenario to be only slightly lower than those under the high water use scenario.

The municipal and domestic diversion demands for 2060 for the Jicarilla Apache Nation, including for domestic and commercial diversions to be made through the NGWSP, under the low water use scenario were calculated as about 75 percent of the projected amounts of diversion for these uses by 2060 under the high water use scenario. This reflects the ratio of the total Rio Arriba County population growth factors for 2010-2060 indicated by the Poster Enterprises 2014 low and high population growth scenarios (1.15/1.53=0.75).

For all Indian and non-Indian municipal and domestic uses, the projected diversions between current or recent conditions and 2060 under the low water use scenario generally were determined by interpolation and considering water use growth trends under the high water use scenario. Under the low water use scenario, the ALP and the NGWSP water allocations and uses in New Mexico would not be fully developed within the 2060 planning horizon. The future total amount of diversion for municipal and domestic uses in the San Juan River Basin in New Mexico was projected to approach about 52,900 ac-ft/yr by 2060 under the low water use scenario.

6.5.4 Industrial (self-supplied)

This category excludes industrial or commercial uses supplied by municipal or domestic public water providers or that might be developed by the Jicarilla Apache Nation from diversions made through the Cutter Lateral of the NGWSP, which for purposes of this RWP update are included in the municipal and domestic water use category.

For the low water use scenario, it was assumed that the annual amount of diversion for self-supplied industrial uses in the San Juan River Basin in New Mexico under recent conditions of about 400 ac-ft/yr would continue through the 2060 planning horizon. For the high water use scenario, it was assumed that the annual amount of diversion for these industrial uses could range up to about 700 ac-ft/yr through the planning horizon based on historical uses. The high water use scenario includes a sufficient amount of water to cover an anticipated growth in self-supplied industrial uses of up to about 10 percent per decade that was estimated by economists based on interviews with industrial users and information from the New Mexico Department of Workforce Solutions (2014).

6.5.5 Power

The projections for future power generation uses in the San Juan Basin region are based on information provided by PNM and APSCo. PNM is scheduled to retire two of the four coal-fired generation units at the SJGS by the end of 2017 and to replace the retired units with two gas-fired generation units. It is anticipated that this will result in a reduction in the average annual water demand for power generation at the SJGS to about 16,000 ac-ft/yr, including water uses for coal mining activities at the San Juan Mine. Based on information provided by APSCo regarding expected water consumption at the FCPP's two remaining coal-fired generation units, the annual diversion demand for the FCPP under current conditions, including for water consumption at the power plant, coal mining activities at the Pinabete extension of the Navajo Mine and replacement of Morgan Lake blowdown releases, is anticipated to average about 26,500 ac-ft/yr beginning about 2020. Thus, the future total amount of diversions for power generation uses in the San Juan River Basin in New Mexico was assumed to average about 42,500 ac-ft/yr through the 2060 planning horizon under the low water use scenario.

For the high water use scenario, it was assumed that the water rights historically developed for power generation uses at the SJGS and the FCPP might be exercised in the future by PNM, APSCo, the Navajo Nation, or others for additional power generation units that might be constructed at the SJGS, the FCPP, or elsewhere in the region, or for other uses depending on future energy demands, regulatory environments, and economic conditions. These water rights include (1) the appropriation of water made pursuant to NMOSE File No. 2838 and (2) the portion of the Jicarilla Apache Nation's Navajo Reservoir water supply contract rights that was subcontracted to PNM for use at the SJGS. The historical maximum annual diversion amount for the SJGS and related mining activities was about 24,800 acre-feet in 2009, and the maximum for the FCPP and related mining activities was about 36,200 acre-feet in 1987. Thus, the future total amount of diversions for power generation uses in the San Juan River Basin in New Mexico was assumed to average about 61,000 ac-ft/yr through the 2060 planning horizon under the high water use scenario. While a portion of the water rights historically used for power generation might be used in the future for other purposes, this projection accounts for the effects that such possible transfers might have on the total diversion demand in the San Juan River Basin in New

Mexico. This is a conservative assumption for planning purposes that reflects (1) the amount of water that has been applied to beneficial use and for which water rights may be licensed or adjudicated and (2) valid water rights that may be exercised in the future at their historical place and purpose of use or that might be acquired and possibly transferred for other uses.

6.5.6 Minerals

For the low water use scenario, it was assumed that the annual amount of diversion for mineral production in the San Juan River Basin in New Mexico under recent conditions of about 1,600 ac-ft/yr would continue through the 2060 planning horizon. This projection excludes diversions of water for mining of coal used for thermal electric power generation at the SJGS or FCPP.

For the high water use scenario, it was assumed based on historical uses that the annual amount of diversion for mineral production could range up to about 2,300 ac-ft/yr through the planning horizon. Alternatively, the high water use scenario can be viewed to cover an increase in water use associated with new drilling for hydraulic fracturing in the San Juan Basin region. Based on interviews with individuals involved in or knowledgeable about the mining sector, it is anticipated that the amount of water use for hydraulic fracturing might increase in all four counties in the region.

6.5.7 Reservoir Evaporation

Projections of reservoir evaporation for other water planning regions consider evaporation rates reported in the *Upper Rio Grande Impact Assessment* (USBR, 2013), which evaluated possible climate change impacts in New Mexico. This report predicted that under possible climate change, by 2060 there might be (1) a small increase in lake evaporation rates due to a possible increase in temperatures and (2) a decrease in average annual reservoir evaporation amounts overall due to a possible increase in drought frequency and consequent reduction in average reservoir inflows that might result in lower reservoir storage levels and reduced average water surface areas. Further, if in the future the average annual NIIP diversion increases to an amount greater than the low water use scenario amount of 337,500 ac-ft/yr, which was the amount of diversion assumed for modeling project impacts in the 1999 NIIP Biological Assessment (KBE and ERI, 1999), the modeled long-term average annual evaporation amount for Navajo Reservoir might be somewhat less than the 27,900 ac-ft/yr of Navajo Reservoir evaporation used in this RWP update for current conditions, depending upon whether other parameters for Navajo Dam release decisions or shortage determinations might result in reductions in withdrawals from storage to offset a tendency for lower storage levels with greater diversion amounts. To be conservative for planning purposes, and considering the substantial uncertainty in the report's climate change predictions and their applicability to Navajo Reservoir or other reservoirs in the San Juan Basin region, for this RWP update the long-term average annual reservoir evaporation

amount for the basin was assumed to remain unchanged at about 29,900 ac-ft/yr throughout the planning horizon under both the low water use and high water use scenarios.

6.5.8 Exports

Future annual diversions from the San Juan River stream system for export to the Rio Grande Basin or Little Colorado River Basin in New Mexico for municipal, industrial, domestic, or irrigation uses are anticipated to average about 120,600 to 120,900 ac-ft/yr by about 2040 under the high water use scenario and by about 2070 under the low water use scenario. This includes:

- The estimated long-term average annual diversion by the SJCP under existing conditions of about 105,200 ac-ft/yr (as there are no current plans to construct facilities to increase the project's diversion capability)
- Development of about 15,100 ac-ft/yr of diversion from the San Juan River or Navajo Reservoir under the NGWSP for export to be used in other basins in New Mexico, including 7,600 ac-ft/yr of project water allocated to supply domestic uses of the Navajo Nation in the Little Colorado River or Rio Grande basins in New Mexico and 7,500 ac-ft/yr of water to supply municipal uses by the City of Gallup in the Little Colorado River Basin
- Diversion and export of groundwater for Gallup's municipal uses in the recent amount of 600 ac-ft/yr through 2024 until NGWSP exports begin, to be reduced to 300 ac-ft/yr thereafter.

The City of Gallup has entered into a subcontract with the Jicarilla Apache Nation to lease 7,500 ac-ft/yr of the Jicarilla's Navajo Reservoir water supply contract allocation to source its water uses under the NGWSP. Construction of the NGWSP diversion works, water treatment plants, and pipeline distribution systems is scheduled for completion by the end of 2024. These NGWSP exports are anticipated to be fully developed by about 2040 under the high water use scenario and by about 2070 under the low water use scenario.

The Northwestern New Mexico Rural Water Projects Act (Public Law 111-11, Title X, Subtitle B) also authorized diversions from the San Juan River under the NGWSP to supply up to 6,400 ac-ft/yr for municipal and domestic uses by the Navajo Nation in the Little Colorado River Basin in Arizona. This authorized exportation of water from the San Juan River Basin in New Mexico to the Little Colorado River Basin in Arizona is expected to begin upon completion of the NGWSP facilities by the end of 2024. Pursuant to the provisions of the Upper Colorado River Basin Compact, the diversions for these uses in Arizona are subject to non-impairment of water uses made within the State of New Mexico's Upper Basin apportionment. Therefore, the NGWSP exports for uses in Arizona are excluded from the projected export diversion amounts for the San Juan Basin region.

6.5.9 Total Regional Water Demand Projections

The total annual amount of diversion in the San Juan River Basin for uses in New Mexico under current or historical conditions was estimated to be about 876,200 ac-ft/yr including basin exports, or about 770,400 ac-ft/yr excluding exports. Under 2060 conditions, it is projected that the potential range of annual total diversions in the basin, depending on the water use scenario, is:

- Including exports: About 836,400 to 1,122,500 ac-ft/yr.
- Excluding exports: About 716,900 to 1,001,600 ac-ft/yr.

7. Identified Gaps between Supply and Demand

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

- Both supplies and demands vary considerably over time, and although long-term balanced supplies may be in place, the potential for drought or, conversely, high flows and flooding must be considered. In general, storage, including the capture of extreme flows for future use, is an important aspect of allowing surface water supplies to be used when needed to meet demand during drought periods (i.e., reservoir releases may sustain supplies during times when surface water supplies are inadequate).
- In wet years when more water is available than in 2010, irrigators can increase surface water diversions up to their water right and reservoirs will fill when inflow exceeds downstream demand, provided that compact requirements are satisfied, to increase storage for subsequent years. Thus, though not quantified, the withdrawals in wet years may be greater than the high projection.
- Supplies in one part of the region may not necessarily be available to meet demands in other areas, particularly in the absence of expensive infrastructure projects. Therefore comparing the supplies to the demands for the entire region without considering local issues provides only a general picture of the balance.
- As discussed in Section 4, there are considerable legal limitations on the development of new surface and groundwater resources, given that surface and surface-connected groundwater supplies are fully appropriated. This affects the ability of the region to prepare for shortages by developing new supplies.
- Besides quantitative estimates of supply and demand, numerous other challenges affect the ability of a region to have adequate water supplies in place. Water supply challenges include the need for adequate funding and resources for infrastructure projects, water

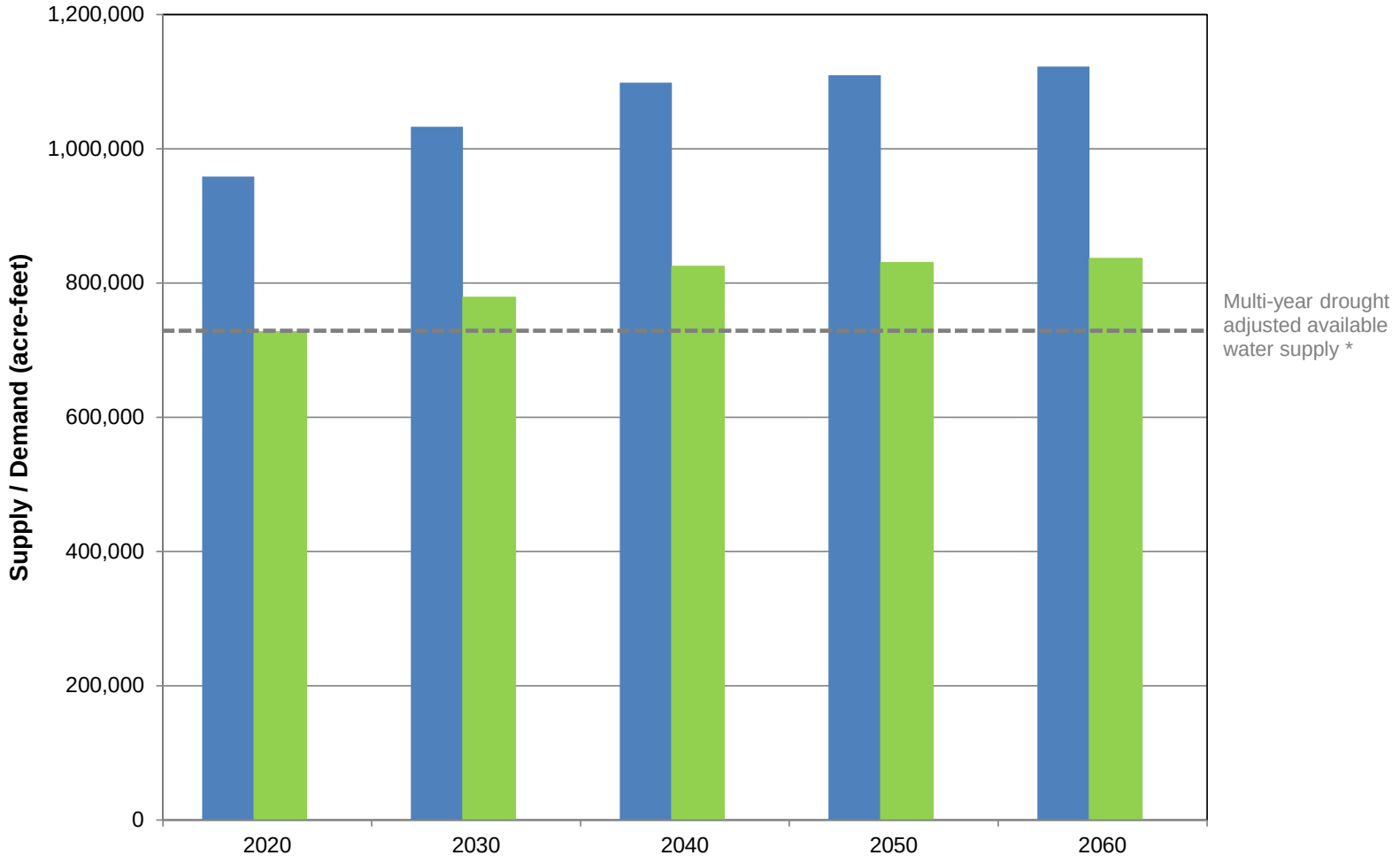
quality issues, location and access to water resources, limited productivity of certain aquifers, and protection of source water such.

Despite these limitations, it is useful to have a general understanding of the overall balance of the supply and demand. Figure 7-1 illustrates the total projected regional water demand in 2060 under the high and low demand scenarios: 1,122,500 acre-feet and 836,400 acre-feet, respectively. It also shows the multi-year, drought-adjusted available water supply, which is estimated at 729,625 acre-feet. Relative to historical or current water use conditions, the projected future total demand amount for the region overall ranges from slight declines under the low water demand scenario to significant growth under the high water demand scenario (Figure 7-1). Overall, the consumptive use of water is much less than the amount of diversion as there is a substantial amount of return flow to the San Juan River stream system from irrigation, municipal, and domestic water uses in the basin.

The diversion demands under the high water demand scenario were developed in coordination with the water uses included in the 2006 State of New Mexico Schedule of Anticipated Upper Basin Depletions (USBR, 2007; Whipple, 2010), with consideration also of the Navajo Decree, the Navajo Supplemental Decree, and settlements entered into by the NMOSE with the SJWC, the City of Farmington, the City of Aztec, and the City of Bloomfield. After consideration of the individual water uses included in both the depletions schedule and the diversions projections, the average annual amount of future depletion from the San Juan River stream system for uses in New Mexico under the high water demand scenario would not exceed the amount of consumptive use available to the State of New Mexico for development under the Upper Colorado River Basin Compact of at least 642,400 acre-feet as determined by the 2007 Hydrologic Determination (USBR, 2007; UCRC, 2006).

Because of the region's reliance on surface water, junior water rights in the region may at times be vulnerable to temporary water use curtailments to (1) meet New Mexico's obligations under the Upper Colorado River Basin Compact during periods of severe and extended drought in the Colorado River Basin, (2) meet water demands under more senior water rights in New Mexico during periods of low direct flow in the Animas River or the San Juan River, or (3) maintain Navajo Reservoir storage at a level above the NIIP intake during periods of extreme drought. This assumes that water rights in the San Juan River Basin in New Mexico are administered strictly by priority consistent with New Mexico State law.

Because junior water rights include those for federal water projects that do or will provide water supply for municipal, industrial, and domestic uses, such as the ALP and the NGWSP, and other water rights that provide for such uses, high priorities for the region might be to increase storage capacity, continue to work cooperatively in the development and implementation of river administration or shortage-sharing agreements, identify alternative groundwater supplies, and develop water banks that could provide for efficient and timely leasing and transfer of senior water rights to vulnerable junior uses.



* Based on the ratio of the minimum value of the three-year moving average to the median value of annual flow of the Animas River near Cedar Hill stream gage, multiplied by the 2060 high demand scenario for the region.

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

Figure 7-1

SAN JUAN BASIN
REGIONAL WATER PLAN 2016

Available Supply and Projected Demand

It is anticipated that the NMOSE will pursue the promulgation of rules and regulations for AWRM in the San Juan River Basin, and water users in the basin are encouraged to participate in that process. Also, the NMOSE continues to work on the San Juan River Adjudication, which is expected to take decades to complete. In the near term, the orderly administration of diversions in the basin while providing for critical water uses to be met during periods of extreme drought may depend on the cooperation of the water users in the basin.

Besides quantitative estimates of supply and demand, numerous other challenges affect the ability of a region to have adequate water supplies in place. Water supply challenges include the need for adequate funding and resources for infrastructure projects, water quality issues, location and access to water resources, limited productivity of certain aquifers, and protection of source water. Another high priority for the region might be to seek protection of watershed health for the region's surface water supplies, including the groundwater in the alluvial aquifers connected to the San Juan, Animas, and La Plata rivers, though it is recognized that most of the watersheds for these rivers are in the State of Colorado.

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 resource 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 San Juan Basin region considered a variety of strategies for addressing these water management challenges. As discussed in Sections 5 and 7, the San Juan Basin region is vulnerable to water quality impairments and the effect of extended drought on surface water supplies. Consequently, the San Juan Basin effort focused on watershed and water quality improvements in addition to overall water resource planning.

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

8.1 Implementation of Strategies Identified in Previously Accepted Regional Water Plan

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

The 2003 San Juan Basin regional water plan recommended the following strategies for meeting future water demand:

- Animas Watershed
  - Additional storage in New Mexico
  - Development of shallow groundwater to improve surface water diversion capabilities
  - Crop leasing during droughts
  - Groundwater exchange with NIIP or Navajo-Gallup facilities
  - Removal of non-native species from riparian areas
  - Cloud seeding
  - Increase Animas-La Plata Project (ALP) storage
  - Storage of stormwater
  - Storage in Gallegos Wash
  - Treatment of saline waters to drinking water quality
  - Enlargement of Farmington Lake
- Blanco Canyon Watershed
  - Erosion control/watershed improvement
- Middle San Juan Watershed
  - Improvements to the operations of Navajo Reservoir
- La Plata Watershed
  - Small reservoir storage (by individuals or ditch companies)
  - Delivery of water from Ridges Basin Reservoir to the Upper La Plata for municipal uses (La Plata Pipeline) through the La Plata Conservancy District in Colorado
- Basin-Wide Alternatives
  - Encourage settlement of the Navajo Nation's water rights
  - Conservation – indoor and outdoor municipal uses
  - Global municipal and irrigation pipeline from Navajo Reservoir
  - Agricultural improvements – on-farm and canal improvements
  - Groundwater exchange to NIIP and/or Navajo-Gallup Pipeline

- Water Banking
  a. Acquire right to store existing direct flow rights in Navajo Reservoir
  b. Leasing of crops
- Additional funding for the Office of the State Engineer

The steering committee reviewed each of the strategies and indicated that most are still relevant, though some are being refocused as new recommended strategies (Appendix 8-A). Actions that have been completed in order to implement the strategies identified in the 2003 plan are summarized on Table 8-1.

8.2 Water Conservation

In the San Juan Basin Water Planning Region many water conservation programs are already in place, as recommended in the 2003 accepted plan (Section 8.1); therefore, few new water conservation projects are included in this RWP update. Water providers in the region will continue to implement their existing water conservation best management practices and drought contingency ordinances. As shown in Table 8-1, several water conservation programs have been implemented since the original plan was accepted in 2003.

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

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

Table 8-1. Implementation Status of Strategies Identified in Accepted Plan San Juan Basin Water Planning Region

Strategy	Status
Animas Watershed	
Additional storage in New Mexico	The City of Aztec has constructed a third reservoir for additional storage of water for municipal supply.
Development of shallow groundwater to improve surface water diversion capabilities	Issues with quality of groundwater make this alternative less feasible.
Crop leasing during droughts	No action has been taken due to lack of funding for implementation studies.
Groundwater exchange with Navajo Indian Irrigation Project (NIIP) or Navajo-Gallup facilities	No action has been taken since 2003.
Removal of non-native species from riparian areas	San Juan Soil and Water Conservation District has annual projects to address this issue.
	New Mexico Interstate Stream Commission (NMISC) has funded non-native and invasive species removal projects.
Cloud seeding	Some cloud seeding projects have been implemented with success in Colorado. NMISC and the San Juan Water Commission have contributed funds to these projects.
Increase Animas-La Plata Project storage	The Animas La Plata Project has been constructed and filled.
Storage of stormwater	Stormwater management best management practices are being implemented throughout the basin.
Storage in Gallegos Wash	This alternative is no longer considered viable.
Treatment of saline waters to drinking water quality	No action has been taken to develop deep saline water supplied due to lack of funding. Some pilot projects to treat produced water from oil and gas operations have been implemented.
Enlargement of Farmington Lake	City of Farmington completed a study to evaluate this alternative. No further activities have been implemented.
Blanco Canyon Watershed	
Erosion control/watershed improvement	The Bureau of Land Management BLM has completed erosion control projects in the Basin.
Middle San Juan Watershed	
Improvements to the operations of Navajo Reservoir	No action has been taken since 2003.
La Plata Watershed	
Small reservoir storage (by individuals or ditch companies)	No action has been taken due to lack of funding.

Table 8-1. Implementation Status of Strategies Identified in Accepted Plan San Juan Basin Water Planning Region

Strategy	Status
La Plata Watershed (cont.)	
Delivery of water from Ridges Basin Reservoir to the Upper La Plata for municipal uses (La Plata Pipeline) through the La Plata Conservancy District in Colorado	Long Hollow Reservoir in Colorado has been constructed and filled.
Basin-Wide Alternatives	
Encourage settlement of the Navajo Nation's water rights	The Navajo Water Rights Settlement was signed in December 2010. Implementation of the settlement provisions is ongoing.
Conservation – indoor and outdoor municipal uses	Several water providers have developed water conservation plans and are implementing best management practices.
	No regional conservation program has been implemented.
	The City of Bloomfield has a grant to replace its irrigation system and install meters.
Global municipal and irrigation pipeline from Navajo Reservoir	No action has been taken due to lack of funding.
Agricultural improvements – on-farm and canal improvements	The Natural Resources Conservation Service (NRCS), with Bureau of Reclamation and State funding, has provided technical assistance, training, and financial support for agricultural improvements.
Groundwater exchange to NIIP and/or Navajo-Gallup Pipeline	No action has been taken.
Water banking	Legislation providing for water banking in the Navajo Reservoir was passed in 2009 (43 U.S. Code § 620n–1). The water bank is referred to as the "Top Water Bank." The NMISC and other partners are working together to develop the guidelines and implement the water banking program.
Acquire right to store existing direct flow rights in Navajo Reservoir	No action has been taken since 2003.
Leasing of crops	No action has been taken since 2003.
Additional funding for the New Mexico Office of the State Engineer (NMOSE)	No significant increase in the NMOSE budget has been implemented.

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

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

The information in Appendix 8-A has not been ranked or prioritized; it is an inclusive table of all of the PPPs that regional stakeholders are interested in pursuing. It includes projects both regional in nature (designated R in Appendix 8-A) and those that are specific to one system (designated SS in Appendix 8-A). The table identifies each PPP by category, including water and wastewater system infrastructure, water conservation, watershed restoration, flood prevention, water reuse, water rights, water quality, and data collection.

In the San Juan Basin region, projects identified on the PPP table are primarily water system infrastructure, irrigation system upgrades, and watershed restoration projects. Because municipal water use is generally low and water conservation programs are already in place, few water conservation projects are included. However, water providers in the region will continue to implement their water conservation programs and drought contingency ordinances.

8.3.2 Key Projects for Regional Collaboration

Prioritizing projects for funding is done by each funding agency/program, based on their current criteria, and projects are reviewed in comparison to projects from other parts of the state. Consequently, the regional water planning update program did not attempt to rank or prioritize projects that are identified in Appendix 8-A. However, identifying larger regional collaborative projects is helpful to successful implementation of the regional plan. At steering committee meetings held in 2015 and 2016, the group discussed projects that would have a larger regional or sub-regional impact and for which there is interest in collaboration with entities in other water planning regions to seek funding and for implementation.

The group used an informal process of discussing and refining the definition of potential collaborative projects to determine the projects of greatest interest. Key collaborative projects identified by the steering committee and San Juan Basin region stakeholders are shown on Table 8-2.

Table 8-2. Key Collaborative Programs, Projects, and Policies
2016 San Juan Basin Regional Water Plan
Page 1 of 4

Project Description	Project Lead	Project Partners	Probable Funding Source(s)	Cost Range	Major Implementation Issues
Watershed, stream and ecosystem restoration					
Continued landscape-scale watershed restoration to protect/restore water quality. The project includes: • Invasive species treatment • Stream and river restoration • Rangeland health and grazing management	San Juan Soil and Watershed Conservation District (SWCD)	• U.S. Forest Service • Natural Resources Conservation Service (NRCS) • New Mexico State Forestry • State Land Office • New Mexico Game and Fish • Navajo Nation • Private landowners • San Juan Watershed Group • Animas Watershed Partnership • San Juan County Extension Agency	• Collaborative Forest Restoration Program (CFRP) • New Mexico State Forestry • New Mexico Environment Department (NMED) 319 and Rivers • Stewardship Program • U.S. Environmental Protection Agency (EPA)	Depends on the size of the project.	• Lack of funding • Engaging landowners
Water quality protection					
Implement source water protection plans and recommendations.	• NMED	• Multiple municipalities within the planning region. • City of Farmington • City of Bloomfield	• NMED Technical Assistance • Water users • City of Grants • Local governments	$15,000 (None when NMED provides technical assistance)	Engaging landowners and stakeholders

Table 8-2. Key Collaborative Programs, Projects, and Policies
2016 San Juan Basin Regional Water Plan

Project Description	Project Lead	Project Partners	Probable Funding Source(s)	Cost Range	Major Implementation Issues
Water quality protection (cont.)					
Continue source water monitoring programs	• San Juan SWCD • San Juan Watershed Group • Animas Watershed Partnership	• NMED • Non-profit organizations participating in local watershed planning activities • Local municipalities through multisector stormwater permitting activities	• NMED • Local governments		
Protect surface water from upstream contamination from abandoned mine sites					
Identify and address risks from upstream abandoned mine releases, and implement mitigation measures.	• U.S. EPA • State of New Mexico	• San Juan and Animas River water users • Navajo Nation • Water suppliers in the region • Private landowners	• U.S. EPA • Superfund • Public/private partnerships	Millions of dollars	Scale and scope of multiple sites and sources. More expensive treatment techniques may be required based on location.
Top Water Bank					
Complete planning and implement pilot water banking program	• Bureau of Reclamation • New Mexico Interstate Stream Commission/ Office of the State Engineer (NMISC/NMOSE)	• Water users within the planning region • Environmental groups	• NMISC • U.S. Bureau of Reclamation (USBR)	Unknown	Complexities associated with water banking.

Table 8-2. Key Collaborative Programs, Projects, and Policies
2016 San Juan Basin Regional Water Plan
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Project Description	Project Lead	Project Partners	Probable Funding Source(s)	Cost Range	Major Implementation Issues
Irrigation conveyance system efficiencies and improvement of management practices					
Increase the efficiency of all irrigation systems in the planning region by updating diversion works, installing measuring devices, cleaning ditches, and checking grade for proper slopes. Ditches can also be lined to improve efficiency. On-farm efficiency measures should also be implemented.	Agricultural water users	• Ditches located throughout the planning region. • Conservation groups • NRCS • Bureau of Indian Affairs (BIA) • USBR • Navajo Nation • NRCS	• Federal and State appropriations • NMISC Acequia Program • NRCS • Farm Service Agency (FSA) • Water Trust Board • Irrigation works projects (NMISC) • U.S. Department of Agriculture (USDA) • BIA • Navajo Nation	Project-specific.	• Lack of funding. Significant resources are required for certain types of projects. • Engineering studies are required for ditch improvements, but funds are limited for planning studies. • Lack of staff within the ditch organizations to prepare and submit funding applications.

Table 8-2. Key Collaborative Programs, Projects, and Policies
2016 San Juan Basin Regional Water Plan
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Project Description	Project Lead	Project Partners	Probable Funding Source(s)	Cost Range	Major Implementation Issues
Water system infrastructure improvements and upgrades					
Multiple system-specific projects to address water system maintenance and infrastructure needs to meet future demand: • Expansion and installation of additional water lines • Well improvements • Sewer system installation and upgrade • Storage tank rehabilitation or installation • Water rights acquisition • Planning documents, water audits, and preliminary engineering reports for water providers in the region that don't have these	Water systems identified in Appendix 8-A	• NMED • New Mexico Rural Water • Northwest New Mexico Council of Governments • Navajo Nation	• Capital Outlay • Water Trust Board • USDA • New Mexico Finance Authority (NMFA) • Navajo Nation	Millions of dollars are needed to address these needs.	• Lack of available funding • Permitting • Potential need for a rate increase • Capacity of systems and complexity of funding process
Address land use and water requirements					•
Develop a model non-alluvial ordinance. Review and evaluate existing County ordinance to identify changes needed to address: • Erosion • Return flow • Service boundary issues	San Juan Water Commission	• City of Bloomfield • City of Aztec • City of Farmington • San Juan County • San Juan Rural Water Users	Local governments	Unknown	• Changes to local land use laws may be difficult to achieve. • Social acceptance

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, San Juan Basin region identified the following recommendations for PPPs to be considered in the state water plan:

- Provide dedicated funding for watershed restoration, leverage, and match.
- Develop policies that provide for water quality protection in headwater watersheds, rivers, and creeks.
- Enforce NMED liquid waste disposal regulations to protect water quality.
- Explore changes to subdivision regulations to support community water supply and return flows.
- To enable efficient and equitable transfers of water for environmental protection through water market transactions, consider statutory and administrative measures to expedite transfers, protect water rights, and monitor compliance. In other western states, surface and groundwater has been efficiently and equitably reallocated (either temporarily or permanently) for environmental purposes through water market transactions. These water markets are enabled by clear statutory provisions to protect water rights used for instream purposes, administrative procedures that allow for expedited water rights transfers, and water agency compliance monitoring. A recent review prepared for the National Fish and Wildlife Foundation assessed the enabling conditions for environmental water market transactions among western states, including New Mexico. The review identified 10 legal elements necessary for environmental water markets, and concluded the following with regard to New Mexico (Szeptycki et al., 2015, p. 39):

New Mexico law includes 5 of the 10 elements of the instream metric, as follows:

- *Recreation, fish, wildlife, and other ecological purposes recognized as beneficial uses in Attorney General opinion.*
- *Legality of transfers of existing water rights to instream uses recognized by Attorney General.*
- *Availability of permanent instream flow transfers.*
- *Express legal protection of conserved use under the Water Conservation Program.*
- *Mechanism for registering informal forbearance deals and protecting rights from forfeiture.*

Missing elements:

- *No express statutory recognition of transfers of existing rights to instream uses.*
- *No expedited review for short-term environmental water transactions, except for emergency transactions.*
- *Limited geographic scope of instream flow rights: distinguish native and San Juan-Chama waters.*
- *Stacking of rights not available.*
- *It is unknown whether private parties can acquire instream flow water rights by transfer without losing the water right's priority date.*

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.

References

Arrowhead Center. 2013. *Economic base studies* [San Juan County]. New Mexico State University. September 2013. Available at <http://arrowheadcenter.nmsu.edu/economic-base-studies>.

Bawazir, A.S., Z. Samani, M. Bleiweiss, R Skaggs, and T Schmugge. 2009. Using ASTER satellite data to calculate riparian evapotranspiration in the Middle Rio Grande, New Mexico. *International Journal of Remote Sensing* 30(21):5593-5603. November 2009. Available at <http://www.researchgate.net/publication/228895780_Using_ASTER_satellite_data_to_calculate_riparian_evapotranspiration_in_the_Middle_Rio_Grande_New_Mexico>.

Brinegar, H.R., and F.A. Ward. 2009. Basin impacts of irrigation water conservation policy. *Ecological Economics* 69(2009):414–426.

B.U.G.S. Consulting. 2011. *Animas River watershed based plan.* Prepared for Animas Watershed Partnership. August 2011. Available at <https://sites.google.com/site/sanjuan watershedgroup/projects/reports>.

Bureau of Business & Economic Research (BBER). 2008. *A report on historical and future population dynamics in New Mexico water planning regions.* Population Estimates and Projections Program, BBER, University of New Mexico. Prepared for the New Mexico Interstate Stream Commission. August 2008. Available at <http://www.ose.state.nm.us/PDF/Publications/TechnicalReports/BBER-WPR-Estimates-Projections-Aug2008.pdf>.

Bureau of Business & Economic Research (BBER). 2012. Projected population, New Mexico counties, July 1, 2010 to July 1, 2040. University of New Mexico. <http://bber.unm.edu/demo/PopProjTable1.htm>. November 2012.

Christensen, N.S., A.W. Wood, N. Voisin, D.P. Lettenmaier, and R.N. Palmer. 2004. The effects of climate change on the hydrology and water resources of the Colorado River Basin. *Climatic Change* 62:337–363. Available at <https://portal.azoah.com/oedf/documents/08A-AWS001-DWR/Supplemental_Beverly_et_al/20040000%20Christensen%20et%20al%20Effects%20of%20Climate%20Change%20on%20Hydrology%20and%20Water%20Resources_Colorado%20River%20B.pdf>.

City of Aztec. 2003. *City of Aztec, New Mexico water conservation plan*. April 1, 2003. Available at <http://www.aztecnm.gov/waterplant/WaterConservationPlan2003.pdf>.

Colorado River Compact. 1922. Available at <https://www.usbr.gov/lc/region/pao/pdfiles/crcompct.pdf>

Coonrod, J., and D. McDonnell. Undated. *Using remote sensing and GIS to compute evapotranspiration in the Rio Grande Bosque.* <http://proceedings.esri.com/library/userconf/proc01/professional/papers/pap487/p487.htm#_INTRODUCTION>. Accessed May 2014.

Dam, W.L. 1995. *Geochemistry of ground water in the Gallup, Dakota, and Morrison aquifers, San Juan Basin, New Mexico.* U.S. Geological Survey Water-Resources Investigations Report 94-4253.

Float ‘n Fish. 2015. San Juan stream improvement. <http://www.sanjuanfloatnfish.com/Maps/River%20Maps/san_juan_stream%20improvements.htm> Accessed June 2015.

Forest Guild. 2008. Managing forests in the face of climate change: A summary of New Mexico Forestry and Climate Change Workshop on November 20, 2008 in Albuquerque, New Mexico. December 2008.

Garfin, G., A. Jardine, R. Merideth, M. Black, and S. LeRoy (eds.). 2013. *Assessment of climate change in the southwest United States: A report prepared for the National Climate Assessment.* A report by the Southwest Climate Alliance. Island Press, Washington, DC.

Gutzler, D. 2003. Drought in New Mexico: History, causes, and future prospects. pp. 101-105 *in* Johnson, P., L.A. Land, L.G. Price, and F. Titus. (eds.), *Water resources of the lower Pecos region, New Mexico: Science, policy, and a look to the future.* Decision-Makers Field Conference 2003, New Mexico Bureau of Geology and Mineral Resources, Socorro, New Mexico. Available at <http://geoinfo.nmt.edu/publications/decisionmakers/2003/DM-2003-Chapter3.pdf> Accessed June 2005.

Hawley, J.W. 1986. Physiographic provinces [and] landforms of New Mexico. p. 23-31 *in* Williams, J.L., ed., *New Mexico in Maps* (2nd edition). The University of New Mexico Press, Albuquerque, New Mexico.

Hurd, Brian and Julie Coonrod. 2008. *Climate change and its implications for New Mexico's water resources and economic opportunities.* Technical Report 45, New Mexico State University.

Intergovernmental Panel on Climate Change (IPCC). 2013. *Climate change 2013, The physical science basis.* Working Group I Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY. 1535p. Available at <http://www.ipcc.ch/report/ar5/wg1/>.

Keller-Bliesner Engineering and Ecosystems Research Institute, Inc. (KBE and ERI). 1999. *Navajo Indian Irrigation Project Biological Assessment.* U.S. Bureau of Indian Affairs, June 11, 1999. Available at <http://www.ose.state.nm.us/Legal/settlements/NNWRS/Initial%20Disclosures/Reports%20and%20Memoranda/19990611_BA_NIIP.pdf>.

Kernodle, J.M. 1996. *Hydrogeology and steady-state simulation of ground-water flow in the San Juan Basin, New Mexico, Colorado, Arizona, and Utah.* USGS Water-Resources Investigations Report 95-4187. 117p.

Levings, G.W., J.M. Kernodle, and C.R. Thorn. 1996. *Summary of the San Juan structural basin regional aquifer-system analysis, New Mexico, Colorado, Arizona, and Utah.* Water-Resources Investigations Report 95-4188.

Longworth, J.W., J.M. Valdez, M.L. Magnuson, and K. Richard. 2013. *New Mexico water use by categories.* Technical Report 54, New Mexico Office of the State Engineer, October 2013. Available at <http://www.ose.state.nm.us/Conservation/PDF/NM%20Water%20Use%20by%20Categories%20Tech.%20Report%2054.pdf>.

Lukas, J., J. Barsugli, N. Doesken, I. Rangwala, and K. Wolter. 2014. *Climate change in Colorado: A synthesis to support water resources management and adaptation*, Second edition. A report for the Colorado Water Conservation Board. Western Water Assessment, Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado Boulder. August 2014. Available at <http://wwa.colorado.edu/climate/co2014report/Climate_Change_CO_Report_2014_FINAL.pdf>.

McCabe, G.J., M.A. Palecki, and J.L. Betancourt. 2004. Pacific and Atlantic Ocean influences on multidecadal drought frequency in the United States. *PNAS* 101(12): 4136-4141.

National Climatic Data Center (NCDC). 2014. Divisional data select. <http://www7.ncdc.noaa.gov/CDO/CDODivisionalSelect.jsp#> Accessed March 13, 2014.

National Weather Service Climate Prediction Center (NWS). 2005. State maps with counties & climate divisions. <http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/regional_monitoring/CLIM_DIVS/states_counties_climate-divisions.shtml> Last modified January 6, 2005.

National Weather Service (NWS). 2015. An introduction to the North American Monsoon System. <http://www.srh.noaa.gov/abq/?n=prepawaremonsoonintro> Accessed December 2015.

Natural Resources Conservation Service (NRCS). 2014a. Monthly snow data. <http://www.wcc.nrcs.usda.gov/nwcc/snow-course-sites.jsp?state=NM> Accessed May 2014.

Natural Resources Conservation Service (NRCS). 2014 b. What is snow water equivalent? <http://www.nrcs.usda.gov/wps/portal/nrcs/detail/or/snow/?cid=nrcs142p2_046155> Accessed September 2014.

Navajo Nation Department of Water Resources, City of Gallup, Northwest New Mexico Council of Governments, and U.S. Bureau of Reclamation (USBR). 2001. *Technical memorandum, Navajo-Gallup Water Supply Project.* March 16, 2001. Available at <http://www.usbr.gov/uc/envdocs/eis/navgallup/FEIS/vol2/Appdx-A/Appdx-A.pdf>.

New Mexico Bureau of Geology & Mineral Resources (NMBGMR). 2003. Geologic Map of New Mexico, 1:500,000. 2 sheets. Available at <http://geoinfo.nmt.edu/publications/maps/geologic/state>.

New Mexico Department of Transportation (NMDOT). 2014. 2040 Statewide Long-Range Multi-Modal Transportation Plan. Presentation to Stakeholders in the Northwest and North Central Regions of New Mexico. September 11, 2014.

New Mexico Department of Workforce Solutions. 2014. Highlights: April 2014 Labor Market Data. *Labor Market Review* 43(4). <http://www.dws.state.nm.us/Portals/0/DM/LMI/lmrApr14.pdf>. Economic Research and Analysis Bureau, Albuquerque, New Mexico. May 23, 2014.

New Mexico Environment Department. 2000. *Solid waste in New Mexico: 2000 Annual report.* December 1, 2000.

New Mexico Environment Department (NMED). 2013. *Procedures for assessing water quality standards attainment for the State of New Mexico CWA §303(d) /§305(b) integrated report: Assessment protocol.* Surface Water Quality Bureau. June 24, 2013. Available at <http://www.nmenv.state.nm.us/swqb/protocols/2014/AssessmentProtocol-w-Appendices-2014.pdf>.

New Mexico Environment Department (NMED). 2014a. 2014 – 2016 State of New Mexico Clean Water Act §303(d)/§305(b) Integrated Report, Appendix A: Final: List of assessed surface waters. Surface Water Quality Bureau. November 18, 2014. Available at <https://www.env.nm.gov/swqb/303d-305b/2014-2016/2014-2016NMList.pdf>.

New Mexico Environment Department. 2014b. GIS dataset provided to Daniel B. Stephens & Associates, Inc. by Office of Information Technology, Enterprise GIS Section. March 25, 2014.

New Mexico Environment Department (NMED). 2015a. New Mexico solid waste landfills-Operating or closure status 2015. August 3, 2015. Available at <https://www.env.nm.gov/swb/documents/FinalUpdatedStateMapLFClosurestatus8-3-15.pdf>.

New Mexico Environment Department (NMED). 2015b. Open permitted landfill list. December 2015. Available at <https://www.env.nm.gov/swb/documents/OpenLFlist.pdf>.

New Mexico Environment Department (NMED). 2016a. Facilities with active tanks by county. <https://www.env.nm.gov/ust/lists.html> Updated January 4, 2016.

New Mexico Environment Department (NMED). 2016b. Current list of domestic and industrial discharge permits. <https://www.env.nm.gov/gwb/NMED-GWQB-PollutionPrevention.htm#PPSlist>. Updated March 30, 2016.

New Mexico Environment Department (NMED). 2016c. NPDES Permits in New Mexico. Surface Water Quality Bureau, Point Source Regulation Section. <http://www.nmenv.state.nm.us/swqb/Permits/>. Accessed May 18, 2016.

New Mexico Environment Department (NMED), New Mexico Bureau of Geology & Mineral Resources (NMBGMR), and New Mexico Department of Health (NMDH). 2016. New Mexico source water protection atlas [GIS dataset]. February 10, 2016.

New Mexico Interstate Stream Commission (NMISC). 2013. Updated regional water planning handbook: Guidelines to preparing updates to New Mexico regional water plans. December 2013.

New Mexico Interstate Stream Commission (NMISC). 2015. Projected water use, 2020-2060, San Juan Water Planning Region. December 31, 2015. Table provided by Kevin G. Flanigan, January 11, 2016.

New Mexico Legislative Jobs Council. 2013. New Mexico Legislative Jobs Council Final Report. December 19, 2013. Available at <http://www.nmlegis.gov/lcs/fileExists/interimreports/JOBS13_2.pdf>.

New Mexico Office of the State Engineer (NMOSE). 2013. *New Mexico water conservation planning guide for public water suppliers.* Technical Report 53. September 2013. Available at <http://www.ose.state.nm.us/WUC/wuc_pws.php>.

New Mexico Office of the State Engineer (NMOSE). 2014a. GIS - Geospatial data and maps. <http://www.ose.state.nm.us/GIS/index.php> Accessed March 2014.

New Mexico Office of the State Engineer (NMOSE). 2014b. Dam safety in New Mexico. Unpublished report provided to Daniel B. Stephens & Associates, Inc. by the NMOSE Dam Safety Bureau, April 2014.

New Mexico Office of the State Engineer (NMOSE). 2014c. Geographical information system data provided to Daniel B. Stephens & Associates, Inc. May 13, 2014.

New Mexico Office of the State Engineer (NMOSE). 2014d. New Mexico water rights reporting system: Point of diversion report selection. <http://nmwrrs.ose.state.nm.us/nmwrrs/well SurfaceDiversion.html> Accessed May 2014.

New Mexico Office of the State Engineer (NMOSE) / New Mexico Interstate Stream Commission (NMISC). 2006. *The impact of climate change on New Mexico's water supply and ability to manage water resources.* July 2006. Available at <http://www.nmdrought.state.nm.us/ClimateChangeImpact/completeREPORTfinal.pdf> Accessed May 9, 2014.

New Mexico Water Quality Control Commission (NMWQCC). 2002. Water quality and water pollution control in New Mexico, 2002: NMED/SWQ-02/1. Available at <http://www.nmenv. state.nm.us/swqb/305b/2002>. Accessed April 15, 2004.

Northwest New Mexico Council of Governments (NWNMCOG). 2007. *City of Bloomfield comprehensive plan 2007-2017.* Prepared in consultation with the staff and citizens of the City of Bloomfield. Final draft approved by City Council April 9, 2007. Available at <http://bloomfieldnm.com/departments/planning-zoning-economic-development/comprehensive-plan/>.

Northwest New Mexico Council of Governments (NWNMCOG). 2012. *McKinley County, New Mexico comprehensive plan update*. September 2012. Available at <http://community.nextone.com/pdf/legal%20pdf%20files/McKinley%20CompPlan_FINAL_9.28.12.pdf>.

Palmer, W.C. 1965. *Meteorological drought.* U.S. Department of Commerce Weather Bureau, Washington, D.C. Research Paper No. 45.

The PRISM Climate Group at Oregon State University (PRISM). 2012. United States average monthly or annual precipitation, 1981-2010. July 10, 2012. Available at <http://www.prism.oregonstate.edu/normals/>.

San Juan Soil and Water Conservation District (SJSWCD), Melissa May, San Juan Watershed Group, Animas Water Partnership, and Geoffrey Smith. 2015. *Summary of the microbial source tracking, E. coli and nutrients presentation.* MST Presentation Summary. March 2015. Available at <http://www.sanjuanswcd.com/images/Summary__of_the_Microbial_Source_Tracking_E._coli_and_Nutrients_Presentation_.pdf>.

San Juan Water Commission (SJWC). 2003. San Juan Hydrologic Unit *Regional Water Plan,* Draft final. October 4, 2003. Available at <http://sjwc.org/>.

San Juan Watershed Group (SJWG). 2005. San Juan Basin watershed management plan. January 2005. Available at <https://www.env.nm.gov/swqb/Projects/SanJuan/BasinPlan/SanJuanBasinPlan.pdf>.

San Juan Watershed Group (SJWG). 2008. *Microbial source tracking study for the San Juan River watershed.* Project plan submitted to BHP Billiton-New Mexico Coal. May 4, 2012. Available at <https://sites.google.com/site/sanjuanwatershedgroup/projects/reports>.

San Juan Watershed Group (SJWG), San Juan Soil and Water Conservation District, Mountain Studies Institute, and Animas Watershed Partnership. 2016. *Lower Animas River watershed based plan, Draft.* May 1, 2016.

Simpson, J. 2006. *Characterization of produced groundwater within the San Juan Basin.* Open-file Report 499, New Mexico Bureau of Geology and Mineral Resources, New Mexico Tech, Socorro, New Mexico. December 2006. Available at <https://geoinfo.nmt.edu/publications/openfile/downloads/400-499/499/ofr-499.pdf>.

Sites Southwest, LLC and Duncan Associates. 2012. *San Juan County growth management plan update*. Prepared for San Juan County. September 2012. Available at <http://www.sjcounty.net/images/stories/Growth_Management_Plan_ Update.pdf>.

Sites Southwest, LLC. 2002. *Tending to the heart of rural community in a changing landscape: City of Aztec comprehensive plan update*. December 2002. Available at <http://www.aztecnm.gov/plans/CompPlan2002.pdf>.

Stewart, R. 2009. The ocean's influence on North American drought. *In Oceanography in the 21st century - An online textbook.* <http://oceanworld.tamu.edu/resources/oceanography-book/oceananddrought.html>.

Stone, W.J., F.P. Lyford, P.F. Frenzel, N.H. Mizell, and E.T. Padgett. 1983. *Hydrogeology and water resources of San Juan Basin, New Mexico*. New Mexico Bureau of Mines and Mineral Resources Hydrologic Report 6. 70p.

Szeptycki, L.F., J. Forgie, E. Hook, K. Lorick, and P. Womble. 2015. *Environmental water rights transfers: A review of state laws.* Prepared by Water in the West for the National Fish and Wildlife Foundation. August 31, 2015. Available at <http://waterinthewest.stanford.edu/sites/default/files/WITW-WaterRightsLawReview-2015-FINAL.pdf>.

Thibault, J., and C. Dahm. 2011. Groundwater well data from the Middle Rio Grande riparian zone (1999-). Dataset available at <http://sev.lternet.edu/node/4256>. Sevilleta Long-Term Ecological Research.

Upper Colorado River Basin Compact. 1948. Available at <https://www.usbr.gov/lc/region/pao/pdfiles/ucbsnact.pdf>

Upper Colorado River Commission. 2006. Resolution of the Upper Colorado River Commission: Regarding the availability of water from Navajo Reservoir for Navajo Nation Uses within the State of New Mexico. Available at <http://www.ose.state.nm.us/Legal/settlements/NNWRS/Responses/Documents%20Produced%20to%20the%20SJWC%20in%20SJWC%20v.%20D'Antonio/OSE-1482%20through%20OSE-1518.pdf>

U.S. Army Corps of Engineers. 1999. National Inventory of Dams (NID) database. <http://nid.usace.army.mil/cm_apex/f?p=838:4:0::NO>

U.S. Bureau of Reclamation (USBR). 2006. *Record of Decision for the Navajo Reservoir Operations, Navajo Unit - San Juan River, New Mexico, Colorado, Utah: Final environmental impact statement.* July 2006.

U.S. Bureau of Reclamation (USBR). 2007. Hydrologic Determination 2007: Water availability from Navajo Reservoir and the Upper Colorado River Basin for use in New Mexico. Available at <https://www.usbr.gov/uc/envdocs/eis/navgallup/FEIS/vol1/attach-N.pdf>

U.S. Bureau of Reclamation (USBR). 2011. SECURE Water Act Section 9503(c) – Reclamation climate change and water 2011. Prepared for United States Congress. April 2011.

U.S. Bureau of Reclamation (USBR). 2012. Colorado River Basin Water Supply and Demand Study. December 2012. Available at <http://www.usbr.gov/lc/region/programs/crbstudy/finalreport/>

U.S. Bureau of Reclamation (USBR). 2013. *USBOR west-wide climate risk assessment: Upper Rio Grande impact assessment.* Upper Colorado Region, Albuquerque Area Office. December 2013. Available at <http://www.usbr.gov/WaterSMART/wcra/docs/urgia/-URGIAMainReport.pdf>

U.S. Census Bureau. 2010. TIGER/Line Shapefile, 2010, 2010 state, New Mexico, 2010 Census Block State-based. <http://www.census.gov/geo/www/tiger>.

U.S. Census Bureau. 2014a. Annual estimates of the resident population: April 1, 2010 to July 1, 2013. American Fact Finder. <http://factfinder2.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t> Accessed May 2014.

U.S. Census Bureau. 2014b. Profile of general population and housing characteristics: 2010. American Fact Finder. <http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=DEC_10_DP_DPDP1> Accessed May 2014.

U.S. Census Bureau. 2014c. State & county quickfacts: New Mexico. Data derived from population estimates, American community survey, census of population and housing, state and county housing unit estimates, county business patterns, nonemployer statistics, economic census, survey of business owners, building permits. <http://quickfacts.census.gov/qfd/states/35000.html> Last revised July 8, 2014.

U.S. Department of Agriculture National Agricultural Statistics Service (USDA NASS). 2014. *2012 Census of agriculture: New Mexico state and county data.* Volume 1, Geographic Area Series, Part 31, AC-12-A-31. May 2014. Available at <http://www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1,_Chapter_2_County_Level/New_Mexico/nmv1.pdf>.

U.S. Environmental Protection Agency (EPA). 2013. Superfund National Priorities List (NPL) sites, EPA Region 6. Vector digital data available at <https://edg.epa.gov/data/public/R6/NPL/>. June 2013.

U.S. Environmental Protection Agency (EPA). 2014. About Superfund: New Mexico site status summaries. <http://www.epa.gov/region6/6sf/6sf-nm.htm>. Accessed June 2014.

U.S. Environmental Protection Agency (EPA). 2015. Final 2015 MSGP documents. <https://www.epa.gov/npdes/final-2015-msgp-documents> Accessed April 2016.

U.S. Environmental Protection Agency (EPA). 2016a. Deleted National Priorities List (NPL) sites - by state. <https://www.epa.gov/superfund/deleted-national-priorities-list-npl-sites-state#NM> Accessed May 20, 2016.

U.S. Environmental Protection Agency (EPA). 2016b. National Priorities List (NPL) sites - by state. <https://www.epa.gov/superfund/national-priorities-list-npl-sites-state#NM> Accessed May 20, 2016.

U.S. Geological Survey (USGS). 2014a. Annual water data reports. <http://wdr.water.usgs.gov>.

U.S. Geological Survey (USGS). 2014b. Groundwater levels for New Mexico. <http://nwis.waterdata.usgs.gov/nm/nwis/gwlevels> Accessed April 2014.

U.S. Geological Survey (USGS). 2014c. USGS surface-water data for the nation. <http://waterdata.usgs.gov/nwis/sw>.

U.S. Geological Survey (USGS). 2014d. National hydrography dataset: Get NHD data [NHD extracts by state]. <http://nhd.usgs.gov/data.html> Accessed August 2014.

U.S. Global Change Research Program (USGCRP). 2009. *Global Climate Change Impacts in the United States: 2009 Report.* <http://nca2009.globalchange.gov/southwest>

Ward, F.A., and M. Pulido-Velazquez. 2008. Water conservation in irrigation can increase water use. *Proceedings of the National Academy of Sciences* 105(47):18215–18220.

Western Regional Climate Center (WRCC). 2014. Cooperative climatological data summaries: NOAA cooperative stations - Temperature and precipitation. <http://www.wrcc.dri.edu/summary/Climsmnm.html>. Data for New Mexico downloaded May-June 2014.

Whipple, John. 2007. *San Juan-Chama Project water supply.* New Mexico Interstate Stream Commission. July 2007. Available at <http://www.fws.gov/southwest/sjrip/pdf/DOC_San_Juan_Chama_Project_Water_Supply_Report.pdf>.

Whipple, John. 2010. *Colorado River Basin Study, Water demands questionnaire, State of New Mexico.* New Mexico Interstate Stream Commission. July 23, 2010. On file at NMISC offices, Santa Fe, New Mexico.

Whipple, John. 2012. *Quantification analysis for the proposed Supplemental Partial Final Judgment and Decree of the Water Rights of the Navajo Nation.* New Mexico Office of the State Engineer. April 2, 2012. Available at <http://www.ose.state.nm.us/Legal/settlements/NNWRS/Quantification%20Analysis/Quantification%20Analysis%20Report%20%20&%20Figs%201-3%20Appendices%20A%20B%20C.pdf>.

Wilbur Smith Associates, Four Corners Planning, Inc., McGinty, Southwest Planning & Marketing, Duncan Associates, and William Freimuth Architecture. 2002. *Farmington comprehensive plan: Framing the future.* October 2002. Available at <http://fmtn.org/DocumentCenter/View/30>.

Appendix 2-A

Master Stakeholder List

San Juan Basin Region 2 RWP Master Stakeholder List

Updated May 16, 2016

Last	First	Affiliation/Category
Armenta	Rubin	Bloomfield Water Supply System
Armijo	Myron	SEO Tribal Liaison
Arnold	Mike	Commissioner - Aztec San Juan Water Commission
Arrington	John	Animas Watershed Partnership
Arviso	Gil	Navajo Water Rights Commission (representing Ft. Defiance Agency) (works @ Navajo Ntn Design & Engrg)
Ashcroft	Nick	West Hammond MDWCA
Austin	Steve	Navajo EPA Water Quality
Ayliffe	Lloyd	Blanco Water Association, Lybrook, Northstar WUA
Barr	Victoria R	BLM, District Manager
Beasley	Janet	Southside Mutual Domestic Water Association
Benally	Rebecca	Shiprock--NTUA
Bentley	Delores	La Vida Mission Community Water Supply
Biemer	Leonard	Citizen
Bishop	Shaun	San Juan Water Commission
Bordegaray	Angela	Water Planner ISC
Brevik	Teresa	City of Bloomfield
Burbridge	Sally	Mayor Aztec
Campbell	Robert	Assistant City Manager City of Farmington
Campbell	Vaughn	Southside Mutual Domestic Water Association
Carpenter	Kim	CEO San Juan County
Cartron	Dominique	Daniel B. Stephens & Assoc
Chapman	Dustin	Lybrook WUA (Cooper Fire)
Chavez	Aaron	San Juan Water Commission
Childs	Katrina	Morningstar WUA, Harvest Gold Subdivision
Choudhary	Trib	Former Demographer Navajo Nation
Cooper	Cy	San Juan Water Commission Farmington
Crawford	Carroll	Bloomfield Irrigation District
Dail	Bryan	NMED

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.

San Juan Basin Region 2 RWP Master Stakeholder List

Updated May 16, 2016

Last	First	Affiliation/Category
Darnell	Dan	City Councilor City of Farmington
Deyo	Emma	San Juan SWCD
Duckett	Nate	City Councilor City of Farmington
Duncan	Martin	San Juan Basin
Dunlap	Jim	San Juan County Rural Water Users Association
Dunn	Steve	Four Corners Economic Development
Eckstein	Scott	Commissioner San Juan County
Eckley	John	Bloomfield & Pine River
Espinosa	Jason	
Epp	Edward	BHP Billiton
Etsitty	Steve	Navajo EPA, Executive Director
Fischer	Mary	City Councilor City of Farmington
Foley	Brandon	NM State Land Office
Fortner	Jack	County Commission Chair San Juan County
Fraser	Conn	San Juan Water Commission
Garcia	Elma	Lumberton WUA
Gasser	Scott	Lindrith Community Water Co-Op
Genualdi	Robert	OSE
Gibbons	Janie	Navajo Dam MDWCA
Goen	Mike	PNM SJGS
Greene	Mike	PNM Project Manager, Generation Asset Management
Harrell	Becky	Animas Environmental Services
Haskie	Lionel	O & M Manager Navajo Agricultural Products Industry
Hathaway	Larry	San Juan County
Hoffman	Rachel	Animas Watershed Partnership
Holmes	Debbie	County Clerk San Juan County
Hopkins	Bonnie	NMSU Extension
Isaacs	Wayne	President BP Billiton
John	Jason	Branch Manager Navajo DNR

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.

San Juan Basin Region 2 RWP Master Stakeholder List

Updated May 16, 2016

Last	First	Affiliation/Category
Johns	Keith	Commissioner San Juan County
Kaufman	Greg	NMED
Keck	Dave	Public Works Administrator San Juan County
Kennedy	Larry	Upper La Plata Water
Kiely	Jeff	Executive Director NW NM COG
Kirk	Robert	Navajo Nation DWR
Kirkpatrick	Randy	Executive Director San Juan Water Commission
Lane	Theresa	San Juan Agricultrual Water Users Assn
Lee	Aaron	Lee Acres Water; Lower Valley Water
Lee	Keith	Lower Valley WUA
Lefevre	Andrea	Jicarilla Apache Nation
Linville	Loren	Northstar MDWCA
Litson	Benita	Dine College Ag
Locke	Roberta S.	Commissioner City of Aztec
May	Melissa	San Juan SWCD
McClure	Katee	Commissioner Aztec
Mays	Robert	City Manager, City of Farmington
McCulloch	Gayla	City Councilor City of Farmington
McDaniel	Margaret	Commissioner San Juan County
Miller	Gordon	San Juan Water Commission
Mitchell	Rick	General Manager Flora Vista Mutual Domestic Water, Southside WUA
Montoia	Paul	City of Farmington
Montoya	Richard	District Conservationist USDA NRCS
Norvelle	Norman	Private
Oldham	Evert	USDA-Rural Development Area Director
Padilla	Ada	Navajo Dam MDWCA
Page	Pat	Navajo-Gallup Water Supply Project, Western Colorado Area Office, US Bureau of Reclamation

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.

San Juan Basin Region 2 RWP Master Stakeholder List

Updated May 16, 2016

Last	First	Affiliation/Category
Pesata	Levi	President Jicarilla Apache Nation
Phelps	Ralph	Rosa Joint Venture
Prda	Sam	West Hammond MDWCA
Rasor	Julie	Administrative Director Four Corners Economic Development
Ray	Joshua	Aztec City Manager
Roark	Elwin	San Juan Water Commission Bloomfield
Rogers	James	Jewett Valley Water Users Association
Rogers	Sheri	Commissioner Aztec
Sandoval	Bert	Navajo Nation Water Rights Commission
Schaeffer	Neal	New Mexico Environment Department
Scott	Jim	Animas Watershed Partnership
Shoultz	David	Navajo Area Indian Health Service (IHS officer, assigned to NTUA)
Simpson	Pat	Commissioner, Cibola County
Sipe	Sherri	Mayor Pro-Tem Aztec
Slape	Roger	NTUA
Smaka	Jeff	Water/Wastewater Administrator City of Farmington
Smith	Russell	President Hammond Conservancy District
Smylie	Dianne	City Clerk City of Farmington
Stock	Lawrence	Farmers Mutual Ditch
Stuever	Mary	District Forester NM State Forestry
Sypher	David	City of Farmington
Todacheene	GloJean	Commissioner San Juan County
Tomko	David	San Juan Watershed Group
Torres	Gary	BLM, Field Manager
Tsosie	Bernadette	Bureau of Indian Affairs
Tsosie	Lewis	Chief Executive Officer (CEO) of NAPI
Velivis	Brandon	Ojo Encino Chapter

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.

San Juan Basin Region 2 RWP Master Stakeholder List

Updated May 16, 2016

Last	First	Affiliation/Category
Wakon	Duane	Associate Planner Farmington MPO
Walravan	Alan	Farmers Mutual Ditch
Watson	Blaine	NM OSE
Watson	Deborah	Area Manager/Geologist Rule Engineering LLC
Watson	William	Public Works City of Aztec
Warner	Ed	Navajo-Gallup Water Supply Project, Western Colorado Area Office, US Bureau of Reclamation
Williams	Shawn	NM OSE
Winters	Audra	President Farmington Chamber of Commerce

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

San Juan Regional Water Plan Compilation of Comments on Draft Plan

NO.	Comment Source	Location (Section/ Page/ Paragraph)	COMMENTS
1	San Juan Water Commission	General	A concern with the document is the use of information that is not cited. References are sometimes provided, but not consistently. There are numerous statements of fact without supporting sources. The author expects the reader to accept the facts as written. Specific examples are provided below.
2	San Juan Water Commission	Figure 5-6	Palmer Drought Severity Index was not fully provided. Graphic was provided without text or scale.
3	San Juan Water Commission	Figures 6-1b, c, and d	Water Demand for Rio Arriba, McKinley, and Sandoval counties are missing. They are shown in the list of figures, but are not provided in the document.
4	San Juan Water Commission	Figures 6-1e and f	Total Regional Water Demand by Section, 2010 and Total Regional Water Demand by County, 2010 are missing.
5	San Juan Water Commission	General	Many acronyms are used without spelling out or defining ex: SJCP (San Juan Chama Project), FCPP (Four Corners Power Plant), etc.
6	San Juan Water Commission	General	There are some typographical and grammatical errors. The following are some examples, but this is not a complete editorial review: a. Pg. 7, first paragraph. Requires a comma .... that, among other this, forms b. Section 6.1 first sentence. Section 5.5 does not mention water use or the OSE 2010 document. Perhaps a typo and should be Section 6.5. c. Need to be consistent. Multiple names used for the same thing .... San Juan Basin Water Planning Region, San Juan Basin region, San Juan region, San Juan Region, San Juan Basin planning region, San Juan planning region, San Juan River Basin and San Juan Basin. If some of these are meant to be different than the planning region, they should be defined by a map.
7	San Juan Water Commission	Page 4 and Section 6.3	Page 4 and Section 6.3 discuss decline in San Juan County population since 2010 using census data. San Juan Water Commission (SJWC) was able to confirm this data from the Census Bureau web site. The data showing decline is based on birth and death vital statistics, and migration from IRS tax exemptions, changes in Medicare enrollment, and "group quarters": Census claims a 3% accuracy from 2000 to 2010 across the US. SJWC questions the use of this short-term data to project long-term population trends. This recent decline may or may not be accurate, but if it is, does not represent the long-term prospects - a long-term trend is not usually postulated from the change in one ten-year period, which may simply reflect short-term changes in economic dynamics, such as the 2008 economic crisis. The low population projections used by the author show zero growth for 2010 through 2020 (Table 6.-3) and less than 1 percent thereafter. Using a growth less than 1 percent for the next five decades is not reasonable since the last 30 years has not seen an average annual growth averaged by 10-year increments less than 1.4%. However, NMBBER in 2008 projected less than 1% growth starting in 2020 through 2060 as a state-wide experience where deaths significantly exceed births. Also, the update to the RWP accepts 2% growth on the Navajo Nation without acknowledging out-migration to other areas in the basin. The high growth estimate presented is reasonable but not excessively high.
8	San Juan Water Commission	Page 7, 1st line	123,500 acre feet includes dead pool. The correct value for active pool should be 109,749 acre-feet. The active storage or total storage number is not used in the analysis of available supply, so this correction is not relevant to results.

San Juan Regional Water Plan Compilation of Comments on Draft Plan

NO.	Comment Source	Location (Section/ Page/ Paragraph)	COMMENTS
9	San Juan Water Commission	Section 5	The water supply is discussed in great length, describing ALP, climate, NGWSP, and numerous other subjects. But in the end, the supply used to compare against some unconventional drought supply in Section 5.5.2 (used on page 53 and Figure 7.1) does not consider those issues described in length. They base the entire basin supply on the Animas River near Cedar Hills gage ... nothing from the San Juan River. The explanation is two paragraphs and results in 730,000 acre-feet (af) per year in a drought year as the supply for the basin. This is considerably less than the sum of sub-basins (862,000 af) from the 2003 RWP 90th percentile drought. NMOSE should consider the large difference between their projection and the 2003 RWP supply analysis that took into account sub-basins. The 730,000 af is derived from the following calculation that SJWC formulated below: ([3-yr lowest years]/median year) times 2060 highest demand. Water supply cannot be based on a ratio of gage data times a synthesized demand. The NMISC Guideline, December 2013 does not identify this method for computing water supply. The water supply for the basin is not based on any data other than to develop a drought factor from the Cedar Hills gage. The way the supply formula works as employed in this section, if someone estimates a larger demand for water, the water supply mystically increases. Furthermore, there is no discussion on the frequency of occurrence that one could expect to experience this theoretical drought. The updated RWP does not describe if it happens once in a hundred years or every five years. This is critical information when evaluating gaps between supply and demand (Section 7) and strategies to meet demands (Section 8). The State's 2013 Guideline says a RWP can use historical diversion data but never suggests using projected demand for water supply calculations.
10	San Juan Water Commission	Section 5.1.2	There is a two-page discussion of climate change and how it might impact water supply, but then the 2016 RWP provides nothing in the analysis about reducing water supply because of climate change.
11	San Juan Water Commission	Section 5.5	The 2016 RWP says it does not follow the 2013 Guideline and gives reasons for not following it, but the resulting method is flawed per item 10 above [comment on Section 5.1.2]. The authors could have followed the 2003 RWP method by identifying supply by sub-basin using stream gages and aggregating to get the basin-wide supply, or by some other logical method.
12	San Juan Water Commission	Section 6.1	The document mixes water rights and use data to develop historical uses. NIIP is metered but non-Navajo uses are identified as 80-85% of water rights. This is acceptable but the differences should be noted.
13	San Juan Water Commission	Section 6.1.1, page 25	Hammond Irrigation has adjudicated water rights under the Martin-Valencia Ditch, on page 327 of the Echo Ditch Decree. It accounts for about 2.5 cfs.
14	San Juan Water Commission	Section 6.1.1, page 26	Using the percentage full for an irrigation ditch to determine demand is not typical practice because it does not consider seepage losses, oversized canals, etc. Measurement of diversions would be more correct. Also, the document describes a range between 80 and 95 percent without explaining what value was actually used to determine demand.
15	San Juan Water Commission	Section 6.1.3 Citations	It is assumed that all the numbers In this section are from Longworth et al., 2013, but the report does not say so. Example: municipal diversions 2010 are 22,200 af per year. Nevertheless, it seems reasonable in comparing the 2003 RWP total of 19,000 in 2000.
16	San Juan Water Commission	Section 6.1.5, page 29	"Up to 138 cfs". The OSE allows for a diversion of up to 205 cfs.

San Juan Regional Water Plan Compilation of Comments on Draft Plan

NO.	Comment Source	Location (Section/ Page/ Paragraph)	COMMENTS
17	San Juan Water Commission	Section 6	Throughout Section 6 -Water Demand, the document repeatedly states what subcategories of water demand are subdivided. Examples: last line page 27; Section 6.1.9 last sentence first paragraph, and Table 6-1, where it is Use Category. Then when the document gets to future uses in Section 6.5, subcategories are used that include ALP, file no. 2883 (Section 6.5.3.1). There is confusion on the use of subcategories (existing uses), subcategories (future uses), and Use Categories.
18	San Juan Water Commission	Page 31	Discussion of riparian water uses and how "riparian evapotranspiration losses might be considered In future regional and state water plan updates" ... but does not appear to be used In any analysis in the RWP update. If not used, it should be stated.
19	San Juan Water Commission	Page 35, 4th paragraph	Majority of farms are on Navajo Reservation - no citation to back up this statement.
20	San Juan Water Commission	Page 41, 3rd paragraph from bottom	The document repeats that future demands are not being done in accordance with methodology of the 2013 Guidelines. The reasoning is almost same as reason for not following Guideline for Supply. However, it appears that the authors did follow the Guidelines for future demands with the exception of not using conservation to reduce demands, which is acceptable. Either they need to be specific on what methodology was not used or revise this paragraph.
21	San Juan Water Commission	Page 41, 3rd paragraph from bottom	Figure 6-2 should be Figure 6-1.
22	San Juan Water Commission	Section 6.5.3.1	This section says the 2003 RWP was used for municipal demands in 2060. The Water Demands section of the 2003 RWP shows only total demands in 2060 (Table 99) and only reports year 2044 municipal demands. This section of the 2016 RWP then states that the population projections for the 2016 RWP would have resulted in 5% LESS demand than the 2003 RWP but does not state what values were used for this analysis. At a minimum, the document needs to be clear as to what demand is used.
23	San Juan Water Commission	Section 6.5.3.1, last sentence, first paragraph	The document does not show in the report, tables, or figures how they "distributed by subcategories".
24	San Juan Water Commission	Section 6.5.3.2, page 45 last sentence	The document states that for the Navajo Nation, the same growth rate that was used in the 2003 RWP for demands between 2040 and 2060 was used for the 2016 analysis. It is not clear why the 2016 analysis falls back on 2003 RWP information when there was great effort to revise population projections lower elsewhere in San Juan County. The authors also accept Trib Choudhary's 2 percent growth rate (page 36, 5th paragraph) but do not tell what is actually used in the 2016 RWP.
25	San Juan Water Commission	Section 6.5.3.2, page 46	The document states that the total demand by NTUA or HIS was "distributed by subcategories" but does not show the distribution.
26	San Juan Water Commission	Section 6.5.3.3	For the Jicarilla, the document does not mention using anything from the 2003 RWP. It appears that the 2003 RWP information was used for municipal throughout the region except for Jicarilla, with no explanation. Also, it "distributed by subcategories" without providing this distribution.
27	San Juan Water Commission	Section 6.5.3.5, page 48, 2nd Paragraph	The calculation for the denominator (high growth rate for San Juan County) is 2.42 instead of 2.47 per Table 6-3b. This would make the low demand slightly higher, 56% instead of 55% of high demand. The 2010 population for San Juan County reported on Table 6-3a (129,634) does not match the 2010 population reported on Table 3-1a (130,044) with no explanation for difference. Perhaps July date for Table 6-3a.

San Juan Regional Water Plan Compilation of Comments on Draft Plan

NO.	Comment Source	Location (Section/ Page/ Paragraph)	COMMENTS
28	San Juan Water Commission	Page 48	Extensive discussion of San Juan County and Rio Arriba but nothing for the other two counties. Maybe need to state reason for exclusion.
29	San Juan Water Commission	Section 6.5.3.5 page 49	Demands were "distributed by subcategories" but the distribution is not reported.
30	San Juan Water Commission	Figure 7-1	The water supply line does not have a value. Maybe lost in copying. It may be the 750,000 af.
31	San Juan Water Commission	Section 7	There is no definition of drought (750,000 af supply) frequency. The document should state that drought supply condition happens once in 100 years or once in 5 years.
32	San Juan Soil & Water Conservation District	Section 5.4 Water Quality Assessment – 5.4.2 Nonpoint Sources	Fifth bullet point edited to read: “Management of invasive woody vegetation along river corridors. Projects completed through partners identified in the San Juan County Community Wildfire Protection Plan”
33	San Juan Soil & Water Conservation District	Section 5.4 Water Quality Assessment – 5.4.2 Nonpoint Sources	Over 90% of samples taken at two sites on the San Juan River were positive for human bacteria. 60% of samples at three sites on the Animas River were positive for human bacteria. This indicates a persistent source of human sewage to the rivers, either from leaking septic tanks, illegal dumping of septage or RV waste, or inadequate wastewater infrastructure.
34	San Juan Soil & Water Conservation District	Section 5.4 Water Quality Assessment – 5.4.2 Nonpoint Sources	Excessive sediment from both natural and anthropogenic sources (e.g. erosion from dirt roads and well pads) is a threat to drinking water intakes as well as irrigation canals.
35	San Juan Soil & Water Conservation District	Table 5-8	Total Maximum Daily Load Status of Streams in the San Juan Basin Planning Area needs several additions to the Probable Sources of Pollutants, as identified in the Lower Animas Watershed Based Plan and San Juan Watershed Group (SJWG) Microbial Source Tracking study • Animas River (Estes Arroyo to So. Ute Indian Tribe bnd) – On-site treatment systems (septic); Illegal dumps or other inappropriate waste disposal; Riparian grazing; Erosion from dirt road network; Natural sources • Animas River (San Juan River to Estes Arroyo) – On-site treatment systems (septic); Riparian grazing; Erosion from dirt road network • San Juan River (Animas River to Canon Largo) – On-site treatment systems (septic); Riparian grazing; Illegal dumps or other inappropriate waste disposal; NOTE – this reach will be re-listed for E.coli impairment of Primary Contact use in the 2016-2018 303(d) list, based on data collected in SJWG Microbial Source Tracking study. • San Juan River (Navajo bnd at Hogback to Animas River) – Riparian grazing; Illegal dumps or other inappropriate waste disposal.
36	San Juan Soil & Water Conservation District	Section 8.1	There are numerous opportunities in the San Juan Basin to conserve water through the modernization of irrigation and water conveyance infrastructure. Earthen ditches and improvised diversion structures are inefficient and negatively impact ditch functions and watershed health. These could be addressed as individual projects through NRCS, the Interstate Streams Commission, and BOR grants, or could be addressed through a more complex process like a Water Trust Board grant or other sources for capital improvement. Most of these projects have not been planned to the extent of having a cost estimate ready for an ICIP, but a comprehensive needs evaluation is underway in 2016 to move these projects forward towards “shovel ready” status.

San Juan Regional Water Plan Compilation of Comments on Draft Plan

NO.	Comment Source	Location (Section/ Page/ Paragraph)	COMMENTS
37	San Juan Soil & Water Conservation District	Section 8.2	Removal of non-native species from riparian areas: Since 2009, at least 6,000 acres of invasive Russian olive and salt cedar have been removed from riparian areas in the San Juan Basin planning area. There are another 1,000 acres that are already funded and slated for removal. This work has been spearheaded by the San Juan Soil & Water Conservation District, with the majority of funding coming from NM State Forestry for hazardous fuels removal.
38	San Juan Soil & Water Conservation District	Section 8.2	Agricultural improvements, on-farm and canal improvements: Several individual ditches have planned and executed canal improvements for water efficiency through NRCS. The Indian Ditch piped a section of their ditch, North Farmington Ditch completed repair of a flume structure, and Graves Attebury Ditch planned pipe structures which now may not be built due to flooding concerns. To our knowledge these are the only ones that have been completed through NRCS cost share. Other ditches have done maintenance and improvements on their own, though the funds for engineering designs remain a huge bottleneck in getting projects from planning phases through to funding and construction. As far as on-farm improvements go, upgrades from flood irrigation to gated pipe, sprinkler, and drip irrigation can improve water use efficiency, but much of the water savings actually go to increased consumptive use by the plant and increased yields, resulting in no net water savings for the basin.
39	San Juan Soil & Water Conservation District	Section 8.3	Attached is a spreadsheet of programs and projects that were proposed for the 2016 Lower Animas Watershed Based Plan [separate file: 4-13-16 SWCD Additions to SJ Basin PPP Worksheet for Regional Water Planning.xlsx].
40	PNM Water Resources	General	Have tried to check all references to PNM, San Juan Generating Station, San Juan Mine, APS, Four Corners Power Plant and Navajo Mine - no comments or changes suggested.
41	PNM Water Resources	General	Should make documents searchable to facilitate review.
42	PNM Water Resources	General	Links to 2003 plan yield "Object not Found".
43	PNM Water Resources	Section 4	Should pull materials referenced in 2003 plan into this update - problematic to have to retain both plans to have all the information.
44	PNM Water Resources	Section 4.2.1.1, last paragraph	Include Water Development Interests and The Nature Conservancy as SJRBIP participants.
45	PNM Water Resources	Section 7	Typo: Relative to historical or current water use conditions, the projected future total diversion amount for the region overall ranges from slight declines under the low water demand scenario to significant growth **in under** the high water demand scenario (Figure 7-1).
46	PNM Water Resources	Section 7	This section relies very heavily on Figure 7-1 to lead the reader to any conclusion - suggest beefing up narrative by describing the numbers in the figure.
47	PNM Water Resources	Section 8	Should require that the Need or Reason column be filled out for each project - without it, decision makers are helpless.

Appendix 6-A

List of Individuals Interviewed

Appendix 6-A. List of Individuals Interviewed
San Juan Basin Water Planning Region

Name	Title	Organization	City
Richard Montoya	District Conservationist	USDA NRCS	Grants
Jeff Kiely	Executive Director	NW NM COG	Gallup
Prestene Garnenez	Regional Planner	NW NM COG	Gallup
Trib Choudhary	Former Demographer	Navajo Nation	Gallup
Robert Campbell	Assistant City Manager	City of Farmington	Farmington
Kim Carpenter	CEO	San Juan County	Aztec
Lionel Haskie	O & M Manager	Navajo Agricultural Products Industry	Farmington
Julie Rasor	Administrative Director	Four Corners Economic Development	Farmington
Duane Wakon	Associate Planner	Farmington MPO	Farmington
Steve Henke	Executive Director	NM Oil & Gas Association	Santa Fe
Mike Greene	Project Manager, Generation Asset Management	PNM	Albuquerque
Randy Kirkpatrick	Executive Director	San Juan Water Commission	Farmington
Eileen Medrano	Environmental Section	Enterprise Products Operating LP	Farmington
Jim McNicol	Assistant Utility Director	Farmington Electric Utility	Farmington
Evan Williams	Deputy Director	NW NM COG	Gallup
Aaron Chavez	Planner	San Juan Water Commission	Farmington
Mark Lautman	Principal	Lautman Economic Architecture Partners, LLC	Albuquerque

Appendix 6-B

Projected Population Growth Rates, 2010 to 2040

Appendix 6-B. BBER Projected Five-Year Population Growth Rates, 2010 to 2040 San Juan Basin Water Planning Region

County	Five-Year Growth Rate (%)					
	2010-2015	2015-2020	2020-2025	2025-2030	2030-2035	2035-2040
San Juan	6.39	5.71	5.24	4.89	4.49	4.04

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

DRAFT
Regional Water Planning Update
Projects, Programs, and Policies
Water Planning Region 2: San Juan

County	Regional or System Specific	Strategy Type (Project, Program or Policy)	Subcategory	Project Name	Source of Project Information	Description	Project Lead (Entity or Organization)	Partners (Other Entities or Participants)	Timeframe (Fiscal Year)	Planning Phase	Cost	Need or Reason for the Project, Program, or Policy	Comments
San Juan	R	Program	Outreach	Animas Watershed Partnership	City of Farmington	Improve water quality in the Animas River	Animas Watershed Partnership	Animas River Stakeholders, NMED, AWP	Ongoing	10,000	250,000	The water quality in the Animas River need to monitored continually to meet water quality standards.	The cost estimate is based upon obtaining grant funding.
San Juan	R	Program	Watershed	Soil health and Ag BMP workshops	2016 Lower Animas Watershed Based Plan Priority Projects		AWP, SJ SWCD, NRCS		Annually 2016-2020		$2,000		Funding: BOR WaterSmart, NRCS
San Juan	R	Project	Water Conservation	Shortage Sharing	BOR	Shortage sharing among major water users in the San Juan River	BOR - OSE	PNM, APS, various ditches, Navajo Nation	Ongoing	5,000	250,000	Parties to the Agreement agree to share shortages during dry periods.	The cost estimate is based upon PNM/APS agreement outlined in Shortate Sharing Agrement.
San Juan	R	Program	Outreach	MS4 Program	Toni Sitka	MS4 Program	City of Farmington	Aztec San Juan County	On going	75,000	1,000,000	1. Corroborate regional MS4 program; 2. Maintain COF MS4 program (testing & projects), 3. Respond to ongoing regulation changes and update MS4 report annually. 4. Outreach programs	A regional MS4 program is being proposed.
San Juan	R	Program	Watershed	MS4 Stormwater Outreach Campaign	2016 Lower Animas Watershed Based Plan Priority Projects		City of Farmington, Aztec, San Juan County, NMDOT, SJWG, SJSWCD, AWP		Ongoing		low		Funding: City MS4 budgets
San Juan	R	Project	Water System Infrastructure	New Scattered Waterline	Northwest New Mexico Council of Governments		Naschitti Chapter				$220,000		
San Juan	R	Program	Watershed	Illegal dumping outreach and enforcement campaign	2016 Lower Animas Watershed Based Plan Priority Projects		NMED Liquid Waste Program, SJWG		Ongoing		$5,000		Funding: NMED Liquid Waste Program
San Juan	R	Program	Watershed	Cost-share funds for individual septic tank repair/replacement; Lobby state legislature to fund the Liquid Waste Indigent Fund	2016 Lower Animas Watershed Based Plan Priority Projects		NMED Liquid Waste Program, SJWG		2019		Unknown		Funding: Liquid Waste Indigent Fund
San Juan	R	Program	Watershed	Ongoing outreach to ag producers to identify needs and project opportunities	2016 Lower Animas Watershed Based Plan Priority Projects		NRCS, SJ SWCD		Ongoing		Variable		Funding: BOR WaterSmart, NRCS
San Juan	R	Project	Watershed	SAN JUAN RIVER BASIN RECOVERY PROJECT-WPF	Capital Outlay		San Juan Basin Recovery Implementation Program		2015		$420,000		
San Juan	R	Project	Water System Infrastructure	Upper La Plata & North Star Regional Waterline	Northwest New Mexico Council of Governments		San Juan County				$2,400,000		
San Juan	R	Policy	Planning	Non-Alluvial Model Ordinance and Xeriscape Ordinance for Mesa Areas	Shaun Bishop	Establish a County-wide Non-alluvial Model Ordinance for any development on the Mesa areas (houses, businesses, etc.). This would include providing water and wastewater systems to the Mesa areas by the entity that services the area under development	San Juan Water Commission		20-30 yrs	development	$20-30,000, (starting)	To protect water quality	
San Juan	R	Policy	Planning	Crop Leasing/Water Banking	Shaun Bishop		San Juan Water Commission						
San Juan	R	Program	Watershed	Removal of Non-native Species	Shaun Bishop		San Juan Water Commission						
San Juan	R	Program	Outreach	San Juan Watershed Group	Paul Montoia	Improve water quality in the Animas and San Juan rivers.	San Juan Watershed Group	Animas and San Juan River Stakeholders, NMED, SJWG	Ongoing	10,000	250,000	The water quality in the San Juan River need to monitored continually to meet water quality standards.	The cost estimate is based upon obtaining grant funding.
San Juan	R	Program	Watershed	Pasture BMPs education and outreach campaign	2016 Lower Animas Watershed Based Plan Priority Projects		SJ SWCD, SJWG, NRCS		2017- 2021		$500		Funding: BHP Billiton BMP grant, NRCS EQIP
San Juan	R	Program	Water Conservation	Irrigation ditch system needs assessment	2016 Lower Animas Watershed Based Plan Priority Projects		SJSWCD, Bureau of Rec, Individual ditch companies		2016		Unknown		Funding: OSMRE VISTA program, BOR
San Juan	R	Program	Watershed	Septic tank inspection and repair campaign	2016 Lower Animas Watershed Based Plan Priority Projects		SJWG, City of Farmington, Aztec, San Juan County		2018		$100,000		Funding: 319 grant

DRAFT
Regional Water Planning Update
Projects, Programs, and Policies
Water Planning Region 2: San Juan

County	Regional or System Specific	Strategy Type (Project, Program or Policy)	Subcategory	Project Name	Source of Project Information	Description	Project Lead (Entity or Organization)	Partners (Other Entities or Participants)	Timeframe (Fiscal Year)	Planning Phase	Cost	Need or Reason for the Project, Program, or Policy	Comments
San Juan	R	Program	Watershed	RV waste disposal signage and outreach campaign	2016 Lower Animas Watershed Based Plan Priority Projects		SJWG, San Juan County		2016-2017		$5,000		Funding: San Juan County, SJWG BHP outreach fund
San Juan	R	Program	Watershed	Utility bill mailing - Outreach flier on proper septic care, permitting, and stopping illegal dumping	2016 Lower Animas Watershed Based Plan Priority Projects		SJWG, San Juan County, City utilities depts.		Annually		$2,500		Funding: County budget, NMED Liquid Waste Program
San Juan	R	Program	Watershed	Green infrastructure/Low Impact Development workshop	2016 Lower Animas Watershed Based Plan Priority Projects		SJWG, SJ SWCD, MS4 participants		2018		$16,000		Funding: 319, city MS4 budgets, registration fees
San Juan	R	Program/Policy	Watershed Restoration	Support Existing Watershed Restoration Plans	RWP Watershed Subcommittee, Lea Knutson, Hermit's Peak Watershed Alliance (HPWA) and the	Support the existing plans that direct various aspects of watershed health restoration. 1. Clean Water Act (319) Watershed Based Plans (EPA approved); 2. New Mexico Forest Action Plan (Statewide Assessment & Strategy Response Plans) – NM Forestry Div; 3. NM Phreatophyte Plan; 4. San Juan Basin Community Wildfire Protection Plan; 5. Carson National Forest Plan; 6. San Juan Field Office Resource Management Plan (Bureau of Land Management); 11. NM State Parks Mgm'tt Plan (Santa Rosa, Villanueva, Conchas Lake, Storrie Lake, Morphy Lake, Coyote Creek State Parks); 12. Las Vegas Nat'l Historic Park Foundation Plan 13. Las Vegas Nat'l Wildlife Refuge Comprehensive Conservation Plan; 14. Rio Mora Nat'l Wildlife Refuge and Conserv. Area Env. Assessment; 15. Fort Union Nat'l Monument. Foundation Document; 16. A Review of the Historic Significance and Management Recommendations for Preserving New Mexico's Acequia Systems (NM Acequia Commission).	Various organizations that have developed and implement these plans	Numerous	Ongoing		Identified in each plan		Considerable work has already gone into the development of these plans and their implementation should be fully supported to improve watershed conditions.
San Juan	R	Project	Water Conservation	Evaluation of Opportunities for Irrigation System Improvements and Water Markets to Support San Juan River Basin Environmental Flows		A study conducted by The Nature Conservancy with funding from the U.S. Bureau of Reclamation. Study goal was to determine opportunities for irrigation system improvements and/or water markets to support San Juan Basin environmental flow for the benefit of endangered fish.	The Nature Conservancy	US BOR				Study findings will help Basin water and natural resource managers plan and implement identified opportunities.	
San Juan	SS	Project	Water System Infrastructure	New Water/Wastewater System	Northwest New Mexico Council of Governments		Beclabito Chapter				$400,000		
San Juan	SS	Project	Watershed	Sagebrush aerial treatment in Arch Rock Canyon & Cox Canyon	2016 Lower Animas Watershed Based Plan Priority Projects		BLM, NMSLO, SJ SWCD		2016-2018		$28,000		Funding: BLM Restore NM grant, NM State Land Office
San Juan	SS	Project	Watershed	Invasive removal, native planting, and small erosion control structures in Cox Canyon	2016 Lower Animas Watershed Based Plan Priority Projects		BLM, NMSLO, SJ SWCD		2019		$30,000		Funding: 319 Grant
San Juan	SS	Project	Watershed	Sediment fences in Cox Canyon	2016 Lower Animas Watershed Based Plan Priority Projects		BLM, NMSLO, SJ SWCD		2019		$38,000		Funding: 319 Grant
San Juan	SS	Project	Watershed	Pinon Juniper thinning in Cox Canyon	2016 Lower Animas Watershed Based Plan Priority Projects		BLM, NMSLO, SJ SWCD		2020		$500,000		Funding: Water Trust Board Watershed Restoration; NRCS EQIP
San Juan	SS	Project	Watershed	Pinon Juniper thinning in Ditch Canyon	2016 Lower Animas Watershed Based Plan Priority Projects		BLM, NMSLO, SJ SWCD		2020		$1,750,000		Funding: Water Trust Board Watershed Restoration; NRCS EQIP

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San Juan	SS	Project	Watershed	1500 acres Pinon Juniper thinning in Flora Vista HUC	2016 Lower Animas Watershed Based Plan Priority Projects		BLM, NMSLO, SJ SWCD		2020		$750,000		Funding: Water Trust Board Watershed Restoration; NRCS EQIP
San Juan	SS	Project	Watershed	Dry sediment basin in Flora Vista HUC	2016 Lower Animas Watershed Based Plan Priority Projects		BLM, NMSLO, SJ SWCD		2021				Funding: 319 Grant
San Juan	SS	Project	Watershed	Salt cedar removal (84.4 acres)	2016 Lower Animas Watershed Based Plan Priority Projects		BLM, SJ SWCD		2017		$168,820		Funding: BLM Riparian,Salinity Control, & Invasive Weed Funds; SJ County Non-native Phreatophyte fund
San Juan	SS	Project	Water System Infrastructure	Cedar Ditch diversion improvement	2016 Lower Animas Watershed Based Plan Priority Projects		Cedar Ditch, BOR, NRCS, SJ SWCD		Unknown		Unknown		Funding: BOR ISC ditch programs, NRCS, The Nature Conservancy
San Juan	SS	Project	Water System Infrastructure	NEWCOMB MID SCHL DRAINAGE SYSTEM	Capital Outlay		Central CSD		2015		$25,000		
San Juan	SS	Project	Water System Infrastructure	Airport Tank Rehab	Jeff Kiely		City of Aztec				$200,000		
San Juan	SS	Project	Water System Infrastructure	Primary Backwash Waste Pond	Northwest New Mexico Council of Governments		City of Aztec				$843,000		
San Juan	SS	Project	Water System Infrastructure	Sewer Interceptor Line	Northwest New Mexico Council of Governments		City of Aztec				$6,030,305		
San Juan	SS	Project	Water System Infrastructure	Treated Water Tank Replacement	Northwest New Mexico Council of Governments		City of Aztec				$575,000		
San Juan	SS	Project	Water System Infrastructure	Wastewater Compost Pad Building	Northwest New Mexico Council of Governments		City of Aztec				$2,000,000		
San Juan	SS	Project	Water System Infrastructure	Water Reservoir 1 Improvements	Northwest New Mexico Council of Governments		City of Aztec				$1,000,000		
San Juan	SS	Project	Water System Infrastructure	Water Reservoir 2 Liner Replacement	Northwest New Mexico Council of Governments		City of Aztec				$550,000		
San Juan	SS	Project	Water System Infrastructure	South Aztec Water System Rehabilitation	2017-2021 ICIP projects	Plan, design, construct, and aquire EA and ROW for the South Aztec Water System Rehabilitation project to include begin planning to determine the first phase of improvements area and begin to install dual pressure regulating valves on a 12 inch main line. Project includes installation of nearly 10,000 feet of 8 inch distribution line and reconnecting taps to the main line.	City of Aztec				$2,828,000	The current South Aztec water utility system is undersized, unmapped, leaks, and has unknown taps and tap locations. The system also has an undersized volume capacity and lacks ISO fire volume capacity.	Phases 2 and 3 include replacement and increase capacity of distribution lines and fire hydrant installation off RD2595 servicing Lobo St, Padilla Way, Story Lane, and Quail Run.
San Juan	SS	Project	Water System Infrastructure	City of Aztec arroyo study & future stormwater infrastructure	2016 Lower Animas Watershed Based Plan Priority Projects		City of Aztec		2016-2017		med-high		Funding: City MS4 budgets
San Juan	SS	Project	Watershed	City of Aztec streambank and river restoration	2016 Lower Animas Watershed Based Plan Priority Projects		City of Aztec, Aztec Ruins National Monument, Eledge Ditch, Kello-Blancett Ditch, landowners		2016-2021		Unknown		Funding: River Stewardship grant, City of Aztec riverbank stabilization ($100k), The Nature Conservancy, BOR & ISC ditch funding
San Juan	SS	Project	Water System Infrastructure	East City Wastewater Trunk Line Project	City of Bloomfield		City of Bloomfield			Planning	$630,000	Increased capacity needed	
San Juan	SS	Project	Water System Infrastructure	Glenwood Waterline and Fire Hydrants	City of Bloomfield		City of Bloomfield			Planning	$288,000	Increased capacity needed	
San Juan	SS	Project	Water System Infrastructure	Northside Secondary Waterlines and Hydrants	City of Bloomfield		City of Bloomfield			Planning	$860,800		
San Juan	SS	Project	Water System Infrastructure	Ulibarri Lane Sewerline	City of Bloomfield		City of Bloomfield			Planning	$288,750	Increased capacity needed	
San Juan	SS	Project	Water System Infrastructure	Water Load Station	City of Bloomfield		City of Bloomfield			Planning/ Design	$80,500	Economic development benefit and increase turnover in north heights tank for north zone.	
San Juan	SS	Project	Water System Infrastructure	Water Storage Tank	Northwest New Mexico Council of Governments		City of Bloomfield				$2,660,000		

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San Juan	SS	Project	Water System Infrastructure	Water Treatment Plant Monitoring Equipment	City of Bloomfield		City of Bloomfield			Planning	$15,000	Not included in the first phase of the water treatment upgrade	
San Juan	SS	Project	Water System Infrastructure	New Wastewater Treatment Plant	City of Bloomfield	Bloomfield needs of a new wastewater treatment facility. It would be beneficial to incorporate into construction additional tertiary treatment utilizing nearby wetlands, turning them into an active healthy wetland that would also serve other purposes such as an educational / recreational park, local water re-use projects, and ultimately provide a higher quality effluent discharge from the wastewater treatment facility into the San Juan River.	City of Bloomfield			Planning	$19-$23 million	The Wastewater Treatment Plant is showing signs of structural failure due to age and improper construction. Bloomfield received a Technical Memorandum identifying structural concerns. $2 million in repairs would yield approx 8 years of life. This provides no operational enhancements, which is now outdated technologically.	
San Juan	SS	Project	Water System Infrastructure	Water Supply Alternate Diversion	2017-2021 ICIP projects, City of Bloomfield	Plan, design, and construct or develop a water supply alternate diversion to include a subsurface diversion to handle sediment, cason to hold the water and a pump station to pump water to the reservoir or the water plant. A second reservoir has already been constructed but due to poor engineering, the reservoir and pump station cannot be used at this time. This reservoir is part of the City's regional water project. Right now the City has a second source point of diversion off the San Juan River.	City of Bloomfield			Planning/ Design	$3,221,125	The collector wells will eliminate the surface water issues of Total Dissolved Solids that the are extremely too high to run through the plant without serious damage to the filters and the plant which will be phased. This is projected to reduce treatment costs at the current treatment center and provide a clean, reliable source of water.	Phase I was the reservoir and phase II will be to complete a consolidation report from all PER's previously done on the San Juan River and River basin. Based on that report, the City will determine where and how many collector wells to install along the river.Capital Outlay has been allocated and Water Trust Board Funding requested for the design phase
San Juan	SS	Project	Water System Infrastructure	Arizona Street Water main upgrade	2017-2021 ICIP projects, City of Bloomfield		City of Bloomfield			Planning	$825,000	Line capacity insufficient, upgrade required	
San Juan	SS	Project	Water System Infrastructure	South Water Storage Tank enlargement	2017-2021 ICIP projects, City of Bloomfield		City of Bloomfield			Planning	$1,182,400	Storage tank capacity insufficient for fire flows and pressure in this zone.	
San Juan	SS	Project	Water System Infrastructure	Southside Waterline Improvements	2017-2021 ICIP projects. City of Bloomfield		City of Bloomfield			Planning	$330,000	Increased capacity needed	
San Juan	SS	Project	Water System Infrastructure	South Booster Station Line Improvements	2017-2021 ICIP projects, City of Bloomfield		City of Bloomfield			Planning	$330,000	Increased capacity needed	
San Juan	SS	Project	Water System Infrastructure	Industrial Blvd (Southside) Waterline	2017-2021 ICIP projects, City of Bloomfield		City of Bloomfield			Planning	$735,379	Capacity insufficient, upgrade needed.	
San Juan	SS	Project	Water System Infrastructure	Water Supply Alternate Diversion	WTB Recommended Projects 1/7/2016 final		City of Bloomfield			Planning	$133,200		Design Phase
San Juan	SS	Project	Water System Infrastructure	City of Bloomfield Water Storage Tank	DWSRLF Comprehensive Priority List (SFY15 Quarter 4) , City of Bloomfield	Construction of 2MG concrete storage tank.	City of Bloomfield			Planning	$1,500,000	Storage tank is at end of life and needs to be replaced.	Cost is based on requested funding.
San Juan	SS	Project	Water System Infrastructure	Current MS4 detention ponds - Porter Arroyo detention pond, Villa View detention pond	2016 Lower Animas Watershed Based Plan Priority Projects		City of Farmington		2016-2017		high		Funding: City MS4 budgets, Capital Outlay
San Juan	SS	Project	Water System Infrastructure	Future MS4 detention ponds	2016 Lower Animas Watershed Based Plan Priority Projects		City of Farmington		2018-2020		med-high		Funding: City MS4 budgets, Capital Outlay
San Juan	SS	Project	Water System Infrastructure	FARMINGTON VILLA VIEW STORM WATER DETENTION POND	Capital Outlay		City of Farmington		2015		$700,000		State funded
San Juan	SS	Project	Water System Infrastructure	Zone 2P Waterline	Northwest New Mexico Council of Governments		City of Farmington				$8,347,415		
San Juan	SS	Project	Water System Infrastructure	Waterline/sewer line Renewal and Replacement	City of Farmington	Replacement of aging infrastructure (i.e. cast iron piping) water/sewer piping and appurtentant facilities	City of Farmington		On going	300,000	30,000,000	Replacement of aging infrastructure (i.e. cast iron piping) water/sewer piping and appurtentant facilities	

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San Juan	SS	Project	Water System Infrastructure	COF Water Treatment Plant	City of Farmington	Replacement of COF's water treatment plant and appurtentant piping	City of Farmington	Water Trust Board	2030	500,000	65,000,000	Replacement of aging COF's water treatment facilities to meet water quality standards.	
San Juan	SS	Program	Monitoring	Water Quality Monitoring	City of Farmington	Renewal of NPDES Continue to monitor Farmington Lake and the Animas River for heavy metals, mussels, bacteria, and other pollutants	City of Farmington	BOR, San Juan Watershed Group, Animas Watershed Partnership NMED	On going	10,000	250,000	Recent events have demonstrated an on-going monitoring program of the Farmington Lake/Animas River/San Juan River for E. Coli, nitrogren, phosphrus, temperature, heavy metals, etc., will be needed.	
San Juan	SS	Project	Watershed	Farmington Animas Rock Garden	2016 Lower Animas Watershed Based Plan Priority Projects		City of Farmington, River Reach Foundation		2017		Unknown		Funding: City of Farmington, River Reach Foundation
San Juan	SS	Project	Watershed	Farmington Anesi Park	2016 Lower Animas Watershed Based Plan Priority Projects		City of Farmington, River Reach Foundation		2019-2022		$515,318		Funding: City of Farmington, DOT trails grant
McKinley	SS	Project	Water System Infrastructure	Rehab/Expand-Sewer System Lagoon	Northwest New Mexico Council of Governments		Coyote Canyon Chapter				$240,000		
San Juan	SS	Project	Water System Infrastructure	New Scattered Waterline Phs II East/Phs III West	2017-2021 ICIP projects	Construction of the waterline extension will serve fifty-four (54) clients and approximately 35 miles. The water supply system will include the plan, design and construct the water transmission line. The design will include approximately 35 miles of 6-16-inch diameter PVC pipeline. (Exact length and diameters will not be known until design completion) Phase I will consist of the planning (feasibility study) for the water supply. Phase II and III will include easements and Right Of Way's, archaeological and environmental studies. Phase IV will include the design of the project and Phase V will consist of the construction. Navajo Nation will own the water project, NTUA will operate water system and Navajo Nation will be the fiscal agent.	Coyote Canyon Chapter				1,800,000		
San Juan	SS	Project	Water System Infrastructure	Regional Beacon-Bisti Lateral Water Project	2017-2021 ICIP projects		Coyote Canyon Chapter				65,750,000		
San Juan	SS	Project	Water System Infrastructure	New Eastside/Hardground Flats Wtrln	2017-2021 ICIP projects		Coyote Canyon Chapter				7,392,000		
San Juan	SS	Project	Water System Infrastructure	CRYSTAL CHP WATER TANK & FIRE PUMP	Capital Outlay		Crystal Chapter		2015		$75,000		State funded
San Juan	SS	Project	Water System Infrastructure	New Sewer Lagoon	Northwest New Mexico Council of Governments		Crystal Chapter				$140,000		
San Juan	SS	Project	Water System Infrastructure	plan, design, construct waterline	DWRF		East Culpepper Flats DWCA		2015		$1,299,657		
San Juan	SS	Project	Watershed	Pipeline erosion control in Cox and Kiffen Canyons	2016 Lower Animas Watershed Based Plan Priority Projects		Enterprise/ other pipeline companies	Unknown;Outreach in 2017			Unknown		Funding: Current pipeline maintenance budgets

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San Juan	SS	Project	Water System Infrastructure	Flora Vista wastewater collection system	Northwest New Mexico Council of Governments	Install a new wastewater collection system to collect and convey wastewater and abandon the septic tanks. Flora Vista will regionalize with the City of Farmington who will ultimately treat and dispose the wastewater. The new collection system will be a combination conventional gravity sewer and low pressure sewer system. An interceptor will convey wastewater to the City of Farmington's sewer system.	Flora Vista				$9,100,000		
San Juan	SS	Project	Water System Infrastructure	New Community Water Line	Northwest New Mexico Council of Governments		Gadii'ahi Chapter				$250,000		
San Juan	SS	Project	Water System Infrastructure	Upgrade Pressurized Irrigation System	Northwest New Mexico Council of Governments		Gadii'ahi Chapter				$1,899,500		
San Juan	SS	Project	Water System Infrastructure	Harper Valley Sanitary Sewer Project	Northwest New Mexico Council of Governments		Harper Valley				$646,000		
San Juan	SS	Project	Water System Infrastructure	Kello-Blancett diversion improvement	2016 Lower Animas Watershed Based Plan Priority Projects		KB Ditch, BOR, NRCS, SJ SWCD		Unknown		Unknown		Funding: BOR ISC ditch programs, NRCS, The Nature Conservancy
San Juan	SS	Project	Water System Infrastructure	Lagoon Ltd. Wastewater System Improvements	Northwest New Mexico Council of Governments		Lagoon Ltd.				$3,417,000		
San Juan	SS	Project	Water System Infrastructure	Renovate Windmill/Wtr Well	Northwest New Mexico Council of Governments		Lake Valley Chapter				$1,112,000		
San Juan	SS	Project	Water System Infrastructure	New Lee Acres Wastewater Systems (Phase 1)	Northwest New Mexico Council of Governments		Lee Acres				$6,500,000		
McKinley	SS	Project	Water System Infrastructure	New Scattered Waterline	Northwest New Mexico Council of Governments		Mexican Springs Chapter				$615,000		
San Juan	SS	Project	Water System Infrastructure	New Pueblo Bonito Waterline	Northwest New Mexico Council of Governments		Nageezi Chapter				$705,000		
San Juan	SS	Project	Water System Infrastructure	Sewer Lagoon Expansion Improvement	Northwest New Mexico Council of Governments		Nageezi Chapter				$800,000		
San Juan	SS	Project	Water System Infrastructure	NAVAJO DAM DWC&MSWC WATER METERS	Capital Outlay		Navajo Dam		2015		$60,000		State funded
San Juan	SS	Project	Water System Infrastructure	Water Meter Equipment	Northwest New Mexico Council of Governments		Navajo Dam Water Consumers Association				$260,000		
San Juan	SS	Project	Water System Infrastructure	Water Storage Tank and Land Acquisition	Northwest New Mexico Council of Governments		Navajo Dam Water Consumers Association				$555,000		

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San Juan	SS	Project	Water System Infrastructure	Scattered Waterline Project	Northwest New Mexico Council of Governments		Nenahnezad Chapter				$3,300,000		
San Juan	SS	Project	Planning	New Narbona Wastewater Treatment Plan	Northwest New Mexico Council of Governments		New Narbona				$441,600		
San Juan	SS	Project	Water System Infrastructure	Replace Scattered Septic Systems	Northwest New Mexico Council of Governments		Newcomb Chapter				$455,000		
San Juan	SS	Project	Water System Infrastructure	On-site treatment utility for Villa de Animas subdivision (CR-2929)	2016 Lower Animas Watershed Based Plan		NMED Liquid Waste Program, Homeowners Association,	Pending NMED enforcement of liquid waste permit reg			Unknown		Funding: Resident User Fees, etc.
San Juan	SS	Project	Watershed	Irrigated cropland BMPs within Animas Valley	2016 Lower Animas Watershed Based Plan Priority Projects		NRCS		2016		Variable		Funding: $100,000 in NRCS EQIP Animas Watershed Initiative
San Juan	SS	Project	Watershed	Flora Vista river and riparian restoration	2016 Lower Animas Watershed Based Plan Priority Projects		Ranchmans-Terrell ditch, SJ SWCD, landowner, San Juan County		2017-2022		Unknown		Funding: River Stewardship grant, The Nature Conservancy,
McKinley	SS	Project	Water System Infrastructure	Upgrade Sewerline/Sewer Lagoon	Northwest New Mexico Council of Governments		Red Rock Chapter				$1,050,000		
San Juan	SS	Project	Water System Infrastructure	New Scattered Waterline Project	Northwest New Mexico Council of Governments		Red Valley Chapter House				$1,560,000		
San Juan	SS	Project	Water System Infrastructure	Repair Earth Dams	Northwest New Mexico Council of Governments		Red Valley Chapter House				$2,150,000		
San Juan	SS	Project	Water System Infrastructure	Ranchmans-Terrell diversion improvement	2016 Lower Animas Watershed Based Plan Priority Projects		RT, BOR, NRCS, SJ SWCD		Unknown		Unknown		Funding: BOR ISC ditch programs, NRCS, The Nature Conservancy
San Juan	SS	Project	Watershed	Road unit erosion control in Hart Canyon	2016 Lower Animas Watershed Based Plan Priority Projects		San Juan Basin Roads Committee, SJ SWCD, BLM		Ongoing		Unknown		Funding: Roads Committee Budget & Cost/share
San Juan	SS	Project	Water System Infrastructure	Sewer line from Farmington to Flora Vista	2016 Lower Animas Watershed Based Plan Priority Projects		San Juan County, City of Farmington, NM State Legislature, Flora Vista Water Users Association		2016-2020		$9,000,000		Funding: $3mil NM General Fund Appropriation already allocated, State Revolving Loan Fund negotiations in progress

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San Juan	SS	Project	Water System Infrastructure	Lake Nighthorse Pipeline	Farmington	Construct a pipeline from Lake Nighthorse to New Mexico. This pipline will serve both municipalities and rural water users	San Juan Water Commission	All those entities who have water rights in Lake Nighthorse	2026	500,000	Planning: 500,000 Design: TBD Construction: TBD	For the benefit of SJWC entities, acquire a pipeline from L. Nighthorse to rural SJWC entities.	
San Juan	SS	Project	Water System Infrastructure	New Community Sewage Lagoon	Northwest New Mexico Council of Governments		Sanostee Chapter				$1,580,000		
San Juan	SS	Project	Water System Infrastructure	New Waterline Ext/Bathroom Additions	Northwest New Mexico Council of Governments		Sanostee Chapter				$2,150,000		
San Juan	SS	Project	Water System Infrastructure	New Blue Mesa Dam	Northwest New Mexico Council of Governments		Sheep Springs Chapter				$2,020,000		
San Juan	SS	Project	Water System Infrastructure	Plan, Design, & Construct Scattered Waterline	Northwest New Mexico Council of Governments		Sheep Springs Chapter				$530,000		
San Juan	SS	Project	Water System Infrastructure	New Mesa Farm Sewerline	Northwest New Mexico Council of Governments		Shiprock Chapter				$12,500,000		
San Juan	SS	Project	Water System Infrastructure	New South Wastewater Ext	Northwest New Mexico Council of Governments		Shiprock Chapter				$1,162,000		
San Juan	SS	Project	Water System Infrastructure	Upgrade Water Treatment Plant	Northwest New Mexico Council of Governments		Shiprock Chapter				$2,000,000		
San Juan	SS	Project	Water System Infrastructure	New North Waterline Extension	2017-2021 ICIP projects		Shiprock Chapter				1,400,000		
San Juan	SS	Project	Watershed	Installation of riparian fence, alternative water source, and filter strip at top 3 riparian pasture priority sites	2016 Lower Animas Watershed Based Plan Priority Projects		SJ SWCD, SJWG, NRCS, landowners		2016-2019		$88,518		Funding: BHP Billiton BMP grant, NRCS EQIP Animas Watershed Initiative
San Juan	SS	Project	Watershed	Installation of riparian fence, alternative water source, and filter strip at Ditch & Tucker riparian pasture priority sites	2016 Lower Animas Watershed Based Plan Priority Projects		SJ SWCD, SJWG, NRCS, landowners		2018-2021		$116,488		Funding: BHP Billiton BMP grant, NRCS EQIP, 319 grant
San Juan	SS	Project	Watershed	Installation of riparian fence, alternative water source, and filter strip at remaining Estes & Flora Vista riparian pasture priority sites	2016 Lower Animas Watershed Based Plan Priority Projects		SJ SWCD, SJWG, NRCS, landowners		2018-2021		$36,652		Funding: NRCS EQIP, 319 grant
San Juan	SS	Project	Watershed	Revegetation of 13.3 miles of river, including pasture areas and areas cleared of Russian olive & salt cedar	2016 Lower Animas Watershed Based Plan Priority Projects		SJSWCD, landowners	Ongoing as RO/SC projects are completed			$140,587 (overlap with ag BMPs)		Funding: NM State Forestry grants, USFWS Partners for Wildlife, NMGF
San Juan	SS	Project	Watershed	Animas River Riparian Restoration (Tucker Canyon HUC)	2016 Lower Animas Watershed Based Plan Priority Projects		SJSWCD, NRCS		2017-2020		$41,264 (overlap with ag BMPs)		Funding: 319 grant, NRCS EQIP or CSP
San Juan	SS	Project	Water System Infrastructure	Lower Animas Ditch siphon erosion control at Knowlton Canyon crossing	2016 Lower Animas Watershed Based Plan Priority Projects		SJWG, Lower Animas Ditch				$22,000		Funding: 319 Grant, Water Trust Board
San Juan	SS	Project	Water System Infrastructure	Lower Animas Ditch siphon erosion control at Hart Valley crossing	2016 Lower Animas Watershed Based Plan Priority Projects		SJWG, Lower Animas Ditch				$12,000		Funding: 320 Grant, Water Trust Board
San Juan	SS	Project	Water System Infrastructure	South Aztec Water System Rehabilitation	Northwest New Mexico Council of Governments		South Aztec Water System				$3,168,000		
San Juan	SS	Project	Water System Infrastructure	New South Water Line Extension	Northwest New Mexico Council of Governments		Tiss Tsoh Sikaad Chapter				$2,428,000		
San Juan	SS	Project	Water System Infrastructure	New Waterline Extension -Biye/White Rock	Northwest New Mexico Council of Governments		Tiss Tsoh Sikaad Chapter				$677,000		
San Juan	SS	Project	Water System Infrastructure	New West Water line Extension	Northwest New Mexico Council of Governments		Tiss Tsoh Sikaad Chapter				$692,000		
McKinley	SS	Project	Water System Infrastructure	Upgrade Septic Tanks Installation	Northwest New Mexico Council of Governments		Tohatchi Chapter				$155,000		

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County	Regional or System Specific	Strategy Type (Project, Program or Policy)	Subcategory	Project Name	Source of Project Information	Description	Project Lead (Entity or Organization)	Partners (Other Entities or Participants)	Timeframe (Fiscal Year)	Planning Phase	Cost	Need or Reason for the Project, Program, or Policy	Comments
San Juan	SS	Project	Water System Infrastructure	New Scattered Waterline Extn	2017-2021 ICIP projects	To secure easements/ROW, archaeological and environmental studies, to plan, design, construct water line extensions (4" PVC pipe, approximately 5 miles) and in the Tohatchi community, McKinley County. Phase 1-is planning/design includes archaeological and environmental studies, ROW and easement. Phase 2-construction will take about 1 year. The water line project will be managed by Tohatchi Chapter and Navajo Tribal Utility Authority (NTUA). NTUA will own and operate the line after construction through a MOU. The Fiscal Agent is the Navajo Nation	Tohatchi Chapter				1,075,000		
San Juan	SS	Project	Water System Infrastructure	AZ-New Ram Pasture Wtrln	2017-2021 ICIP projects		Tsaile/Wheatfields				260,000		
San Juan	SS	Project	Water System Infrastructure	AZ-New Blackrock Wtrln	2017-2021 ICIP projects		Tsaile/Wheatfields				1,240,000		
San Juan	SS	Project	Water System Infrastructure	NM-New Upper Wheatfields Waterline	Northwest New Mexico Council of Governments		Tsaile/Wheatfields Chapter				$1,220,000		
San Juan	SS	Project	Water System Infrastructure	New Sewer Lagoon	Northwest New Mexico Council of Governments		Tse' Daa Kann Chapter				$400,000		
McKinley	SS	Project	Water System Infrastructure	Upgrade Waterline Project ~ Senior Center	Northwest New Mexico Council of Governments		Twin Lakes Chapter				$100,000		
San Juan	SS	Project	Water System Infrastructure	New Wastewater Project	Northwest New Mexico Council of Governments		Two Grey Hills Chapter				$305,000		
San Juan	SS	Project	Water System Infrastructure	New Water Development Project	Northwest New Mexico Council of Governments		Two Grey Hills Chapter				$355,000		
San Juan	SS	Project	Water System Infrastructure	New Sewer Lagoon/Water Treatment Facility	Northwest New Mexico Council of Governments		Upper Fruitland Chapter				$1,470,000		
San Juan	SS	Project	Water System Infrastructure	UPPER LA PLATA MDWCA&MSWC WTR SYS IMPROVE	Capital Outlay		Upper La Plata MDWCA		2015		$600,000		State funded
San Juan	SS	Project	Water System Infrastructure	Install Larger Pumps at Pump Station #2	Northwest New Mexico Council of Governments		Upper La Plata Water Association				$55,000		
San Juan	SS	Project	Water System Infrastructure	Replace 4" line w/ 8" line from Hwy 170 to Tank #1	Northwest New Mexico Council of Governments		Upper La Plata Water Association				$155,000		
San Juan	SS	Project	Water System Infrastructure	Replace and Upsize Tank #1	Northwest New Mexico Council of Governments		Upper La Plata Water Association				$390,000		
San Juan	SS	Project	Water System Infrastructure	Replace Tank #3	Northwest New Mexico Council of Governments		Upper La Plata Water Association				$310,000		
San Juan	SS	Project	Water System Infrastructure	Upper La Plata & North Star Regional Waterline	Northwest New Mexico Council of Governments		Upper La Plata Water Association				$2,400,000		
San Juan	SS	Project	Water System Infrastructure	Waterline Expansion	Northwest New Mexico Council of Governments		Upper La Plata Water Association				$2,560,000		
McKinley	SS	Project	Water System Infrastructure	Construct Waterline Rincon Marquis, Sandsprings, White Horse	Northwest New Mexico Council of Governments		White Horse Lake Chapter				$315,000		
McKinley	SS	Project	Water System Infrastructure	New Northeast Bathroom Additions	Northwest New Mexico Council of Governments		White Horse Lake Chapter				$570,000		
McKinley	SS	Project	Water System Infrastructure	New Sandsprings/Rincon Marquis Bathroom	Northwest New Mexico Council of Governments		White Horse Lake Chapter				$640,000		
McKinley	SS	Project	Water System Infrastructure	New Scattered Waterline	Northwest New Mexico Council of Governments		White Horse Lake Chapter				$505,000		
McKinley	SS	Project	Water System Infrastructure	Rincon Marquez Waterline	Northwest New Mexico Council of Governments		White Horse Lake Chapter				$200,000		
San Juan	SS	Project	Water System Infrastructure	A New Community Sewer Lagoon	Northwest New Mexico Council of Governments		White Rock Chapter				$700,000		
San Juan	SS	Project	Water System Infrastructure	New Community Cistern System	Northwest New Mexico Council of Governments		White Rock Chapter				$60,000		
San Juan	SS	Project	Water System Infrastructure	New Indian Creek Waterline	Northwest New Mexico Council of Governments		White Rock Chapter				$1,596,000		
San Juan	SS	Project	Water System Infrastructure	Cutter Lateral Waterline Project	2017-2021 ICIP projects		White Rock Chapter				150,000		