Executive Summary

The Northeast New Mexico water planning region (Northeast Region), which includes Union, Harding, Quay, Curry, and Roosevelt Counties (Figure ES-1), is one of 16 planning regions in 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. Regional water planning activities are funded and overseen by the New Mexico Interstate Stream Commission.

Regional water planning activities for the Northeast Region are overseen by a steering committee consisting of representatives from counties, municipalities, soil and water conservation districts, the agricultural sector, and others. The designated fiscal agent for the Northeast Region is the City of Tucumcari, who retained the team of Daniel B. Stephens & Associates, Inc., Sites Southwest, LLC, Sheehan, Sheehan and Stelzner, Amy C. Lewis, and Michael Barnes to develop this regional water plan.

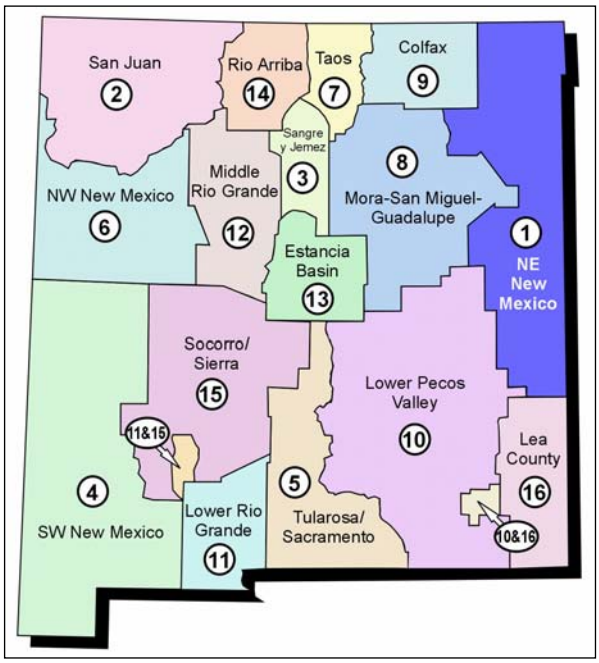

Figure ES-1. Northeast New Mexico Water Planning Region

Key water issues facing the Northeast Region are:

- *Long-term water supply availability.* All municipal water in the planning region is currently supplied by groundwater, and a significant portion of the planning region's groundwater supply comes from the Ogallala aquifer, where declining water levels and projected dewatering of portions of this aquifer indicate the need for additional monitoring and careful management practices. Some portions of the planning region are examining possibilities for using a renewable surface water source, including importing Ute Reservoir water through the Eastern New Mexico Rural Water System project (also

referred to as the Ute Pipeline), as a future water supply. Members of the Eastern New Mexico Rural Water Authority need near-term (over approximately the next 10 years) fiscal and programmatic support for the ongoing development of the groundwater resource to meet their needs until such time as the Eastern New Mexico Rural Water System project is able to provide them with municipal and industrial water.

- *Infrastructure needs.* Upgrades to address aging infrastructure are needed in communities throughout the region. The Village of Des Moines is in need of a new water source and has identified drilling a new well in the Capulin Basin as the favored alternative. The Village's need is seen as a priority by the entire region. The possibility of implementing a regional system serving the Villages of Des Moines, Folsom, Grenville, and Capulin is also being discussed.

- *Protection of water rights.* Most of the planning region has not been adjudicated, and the resulting uncertainties regarding water rights ownership create complexities in the planning process. Efforts to protect water rights and ensure that water resources remain within the planning region were identified as priorities during the planning process. Of particular concern is protection of water rights and water resources along the Texas border.

- *Water quality.* There is considerable interest within the region in protecting and/or enhancing water quality, in particular, protecting Ute Reservoir water quality from septic systems near the lake.

- *Rangeland and watershed management.* The need for rangeland and watershed management to protect water quality and potentially to reduce riparian depletions is seen as an important component of the planning effort. There is consensus in the region that all salt cedar removal efforts should be supported.

- *Drought vulnerability.* Although the bulk of the needs in this region are met by groundwater, there is still concern over drought vulnerability. Surface water currently supplies agricultural users in the Arch Hurley Conservancy District on the Canadian

River and along the Dry Cimarron and is expected to supply municipalities in the southern portion of the region (through the Eastern New Mexico Rural Water System) in the future.

- *Economic development.* The region is pursuing economic development opportunities, including tourism, recreation, and commercial and or industrial development. Ensuring that long-term supplies are adequate to support the growth and vitality of the region is a key concern.

- *Data gaps.* Lack of information about water use, water depletions, and extent of water resources causes uncertainty in water planning efforts.

The New Mexico Interstate Stream Commission's *Regional Water Planning Handbook* serves as a guideline for regional water planning in New Mexico and has been used as an outline for this water plan. According to the template, a regional water plan must address the following questions:

- What is the available water supply?
- What are the current and projected future water demands?
- What steps will the region undertake to meet future demand with available supply?

To address available water supply, this plan discusses the physical availability of water as well as the water rights and legal constraints that affect the availability of water. Regional water demand is addressed by evaluating historical and current regional water demand and by analyzing projected population and economic growth to develop projections for future water demand. The ability to meet future water demand with available supply is addressed by the identification and evaluation of water plan strategies.

Water Supply

As required by ISC guidance, existing sources of information about surface water and groundwater supplies in the five counties were used to characterize the regional water supply.

These sources included documents by federal, state, and local agencies, academic research, and privately funded works.

Surface Water

Surface water currently supplies less than 25 percent of the water used in the Northeast Region, although it is becoming more important in the region as groundwater supply diminishes. Surface water is used for irrigation and livestock watering, as well as for reservoir evaporation. The majority of surface water is found in the Canadian River and its tributary Ute Creek and in the Dry Cimarron River (Figure ES-2). Except for playa lakes, no perennial surface water features are found in the southern half of the planning region.

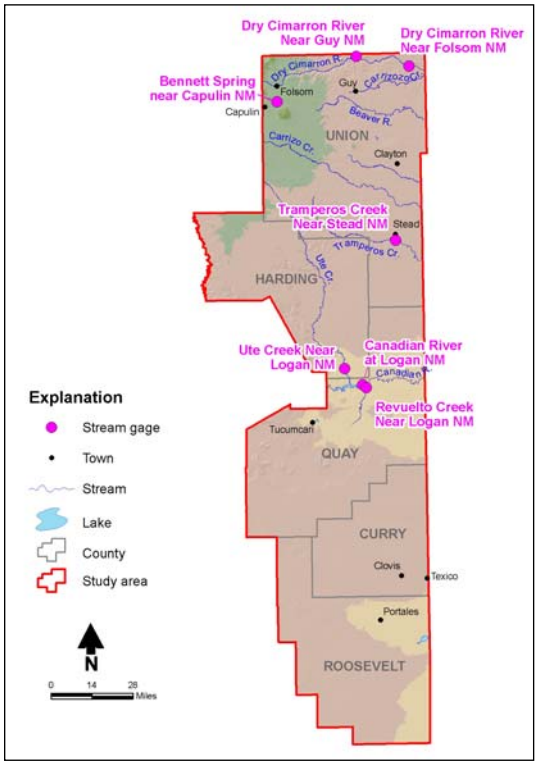

Figure ES-2. Surface water and stream gage locations

Surface water flows originate primarily in the mountains to the northwest in Colfax and Mora Counties and to the north in Colorado. Flows are highly variable from year to year, as illustrated by Figure ES-3, which shows annual flows observed at the U.S. Geological Survey stream gaging stations in the planning region for their periods of record (the locations of these gages are shown on Figure ES-2). (The Canadian River at Logan maximum flow [almost 1,600,000 acre-ft in 1941] has been excluded from Figure ES-3 to allow the flow ranges from all gages to show more clearly.)

None of the communities in the region rely on surface water for their public water systems. However, the communities of Clovis, Elida, Grady, Melrose, Portales, and Texico, Curry, and Roosevelt Counties, and Cannon Air Force Base anticipate receiving municipal supply from Ute Reservoir in the future, through the Eastern New Mexico Rural Water System (ENMRWS), and Tucumcari, Logan, San Jon and Quay County maintain rights to Ute Reservoir water that can be withdrawn by means other than the ENMRWS.

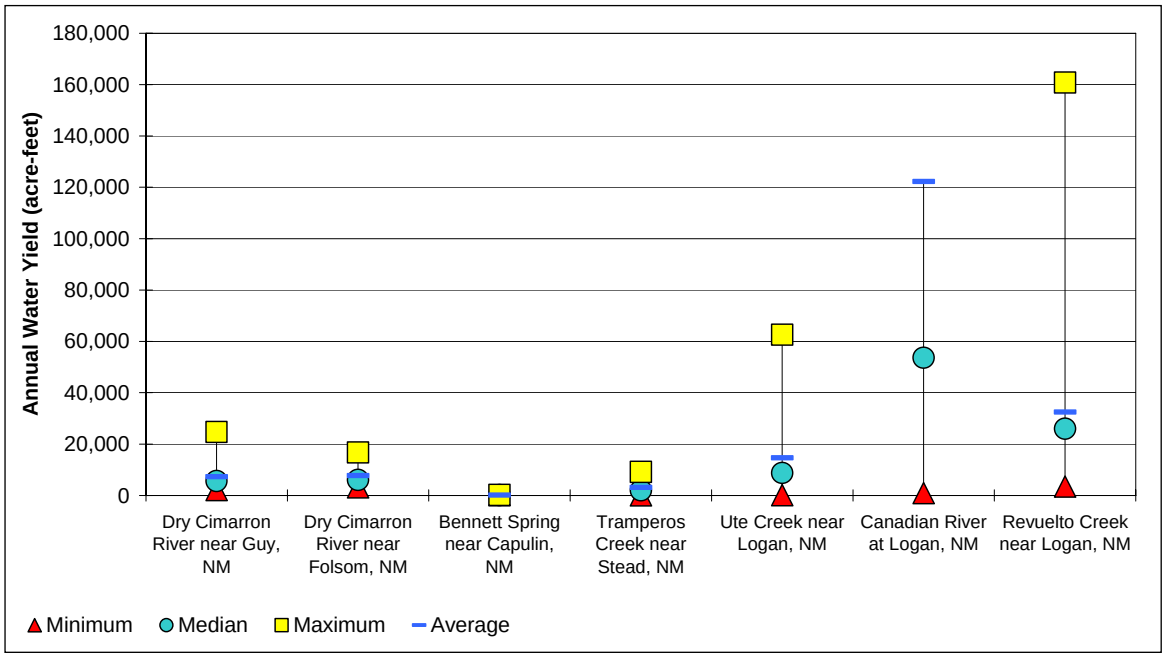

Figure ES-3. Typical surface water flows for stream gage periods of record

Groundwater

Groundwater supplies more than 75 percent of the water currently used in the Northeast Region and is the sole source of drinking water supplies for all communities and rural residences in the planning region. The region contains all or part of eight separate groundwater basins declared by the New Mexico Office of the State Engineer (OSE) (Figure ES-4).

Local groundwater resources include the Ogallala Formation (Figure ES-5; also called the High Plains aquifer) in parts of all five counties, sandstone units including the Dakota, Morrison, and Entrada formations in Union, Harding, and Quay Counties, and the Dockum Group (Chinle/Redonda Formation and Santa Rosa Sandstone) in Quay County. Groundwater sustainability concerns are centered on areas supplied by the Ogallala aquifer, as it supplies the bulk of groundwater use in the Northeast Region yet exhibits the most significant water level declines. In 2000, the maximum saturated thickness of the Ogallala aquifer in New Mexico was 200 feet. Concerns about the sustainability of the Ogallala aquifer are most acute in Curry and Roosevelt Counties, particularly near Clovis, Texico, and Portales, where water levels decline at rates of more than 2 feet per year. Aquifer sustainability is less of an issue in most of Harding and Quay Counties, where Ogallala water levels appear to be fairly stable.

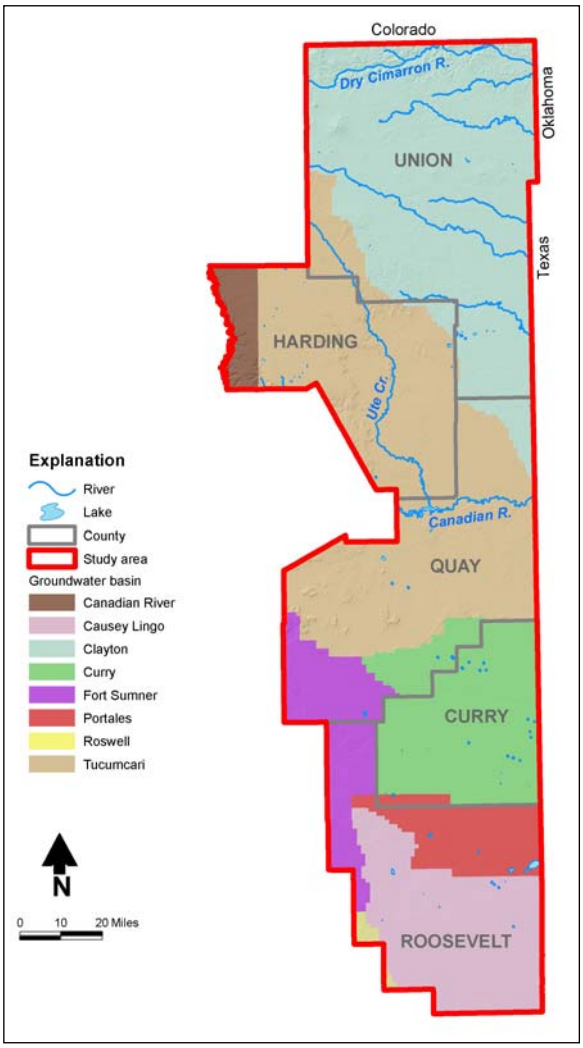

Figure ES-4. OSE-declared groundwater basins

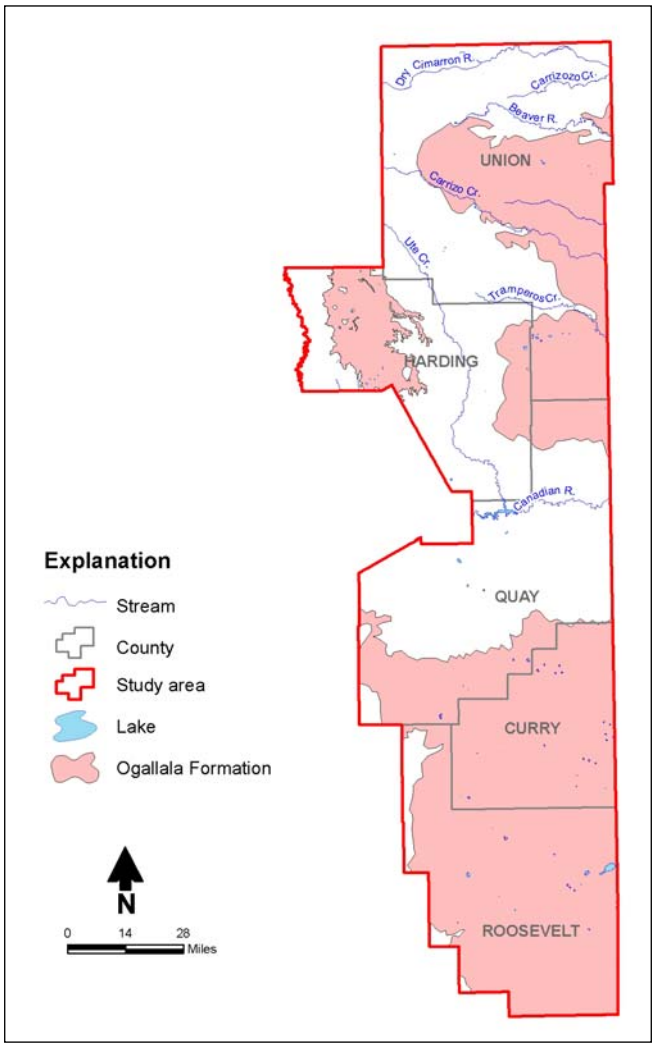

Figure ES-5. Extent of Ogallala aquifer in Northeast Region

Several modeling efforts have been conducted to simulate changes in water levels based on current economic trends, governmental policies, and pumping rates, and results have indicated average saturated thicknesses as little as 25 feet in the Southern Ogallala by the year 2020 and 50 feet in the central portion of the aquifer by 2050, with many areas of the Ogallala completely dewatered. Modeling of the Southern Ogallala indicated that significantly decreasing current pumping could prolong the life of the aquifer.

Aquifer sustainability is also a concern for the Dakota aquifer near Clayton and Sedan and the Entrada Sandstone aquifer near Sedan in Union County, where water levels decline at rates of greater than 1 foot per year.

Water Quality

Groundwater in the planning region is generally of high quality. It is suitable for agricultural and private domestic consumption and can easily be treated for public water supply system use. Potential threats to groundwater quality include leaking underground storage tanks; nitrates from agricultural activity, dairy operations, septic tanks, and public and private sewage treatment plants; and petroleum, methane, and total dissolved solids contamination from oil and gas field operations.

The primary surface water quality concern in the Northeast Region is nonpoint source (i.e., indirect) contamination. Several river reaches have water quality that is insufficient to fully support their designated uses due to turbidity, stream bottom deposits, nutrients, metals, pathogens, temperature, and total dissolved solids. The sources for these pollutants include agriculture, recreation, road runoff, road construction, and municipal point (i.e., direct) sources. Potential contamination of Ute Reservoir by septic systems is also a surface water quality concern. Nonpoint source contamination is a particular concern because of the recent and projected development around Ute Reservoir, which will include septic systems, a golf course, increased recreational pressure, and runoff from a variety of developed land uses.

Legal Issues

Regional water planning is subject to “laws relating to impact on existing rights” (NMSA 72-14-44C(7)), and planners have no authority over allocation or ownership of water rights. However, legal issues can limit the water supply in certain circumstances and must therefore be fully understood and incorporated into actions or recommendations included in this water plan.

Water Rights in New Mexico

The OSE manages water rights in New Mexico, and a user must have a water right or obtain a water permit or license from the OSE in order to withdraw groundwater or divert surface water. In addition to requiring a permit for new groundwater withdrawals throughout the region, the OSE may impose additional administrative criteria that further limit usage, especially in declining or mined aquifers, but such criteria have not yet been placed on many of the mined aquifers in the Northeast Region.

Water rights may be transferred, sold, or leased, but such transactions are subject to protest, cannot impair existing water rights, and must not be contrary to public welfare or conservation. If water rights are not used during four consecutive years, they may be forfeited, following notice from the OSE.

A number of legal issues facing the region are described below.

Endangered Species Act

The Endangered Species Act (ESA) can play a prominent role in river management, including the timing and releases of flows. In the Northeast Region, populations of the Arkansas River shiner, which has been listed as threatened under the ESA, are present on the Canadian River downstream of Ute Reservoir. Although critical habitat has been designated for the Arkansas River shiner, no area within New Mexico was included in this designation because the U.S. Fish and Wildlife Service felt that implementation of the Arkansas River Shiner Management Plan will effectively manage the New Mexico portion of the shiner's habitat. Actions under this plan include managing the volume and timing of Ute Reservoir releases to benefit Arkansas River shiner spawning and maintaining the existing 3- to 5-cubic foot per second base flow from Ute Reservoir.

Status of Adjudication

A water rights adjudication is a lawsuit that determines the extent and ownership of each water right in a specific geographical area. An adjudication begins with a hydrographic survey of a stream system, where the elements and ownership of each water right in the survey area are determined. The final court decree removes controversies concerning title to water rights and the validity of water rights.

The main stem of the Canadian River and associated groundwater have not been adjudicated, and due to ongoing adjudications in other basins, the State of New Mexico is unlikely to initiate an adjudication of the Canadian River for many years. Nevertheless, surface water in the Canadian River is considered to be fully appropriated.

The adjudication of the Dry Cimarron and its tributaries was completed in 1933. The final decree in that adjudication established the rights of the various water right claimants to "divert,

impound and beneficially use" the waters of the Dry Cimarron River and its tributaries. The decree discusses 69 separate water rights and includes special provisions describing the agreement among the parties regarding the management of diversions along the ditches where the rights are taken. The decree allows for livestock watering and domestic use from the stream system.

The Fort Sumner and Roswell Underground Water Basins, small portions of which are located in the Northeast Region, were adjudicated as part of the Pecos River Adjudication.

No major adjudication activities are currently taking place in the region.

Administrative Policies for the Canadian Basin

The Canadian River Compact, ratified in 1951, allows New Mexico the "free and unrestricted use" of all waters originating in the drainage basin of the Canadian River above Conchas Dam as well as waters originating below the dam. The Compact limits storage of water below Conchas Dam to 200,000 acre-feet of conservation storage, but does not require New Mexico to deliver specific amounts of water to the State of Texas. New Mexico stores water under the terms of the Compact in Ute Reservoir.

The groundwater in the Canadian Basin is stream-connected, which means that any new groundwater development that may affect the Canadian River must be offset; that is, surface water rights must be purchased and retired in order to offset the effects of the proposed groundwater pumping. If an applicant could show that the new groundwater diversion would have no impact to the river at any time, then the OSE could approve the application.

The State Engineer has not issued administrative criteria for many of the groundwater basins in the Northeast Region, and water right applications in the basin are analyzed on a case-by-case basis.

Texas Groundwater/Border Issues

The Ogallala aquifer straddles the New Mexico-Texas state line, and use of groundwater in Texas is thus a public concern in eastern New Mexico. Groundwater is managed on the state level, and while New Mexico manages groundwater based on the prior appropriation doctrine,

protecting senior water rights, Texas manages groundwater using the rule of capture, which allows land owners to capture groundwater available under their property without regard to impacts to other users. The Texas groundwater management districts adjacent to the area (the North Plains Groundwater Conservation District and the High Plains Underground Water Conservation District No. 1) manage groundwater in their districts using the 50/50 rule, which mandates that 50 percent of the saturated thickness remaining in 1998 remain available for 50 years (until 2048).

Current Regional Water Demand

Current and historical water demand in the Northeast Region was obtained for the period 1975 through 2000 from the New Mexico OSE, which inventories water use in the state every five years and publishes the results in technical reports. Several OSE-defined categories, such as commercial, mining, power and industrial, have little or no historical use in the planning region. Consequently, for this regional water plan, the OSE categories were streamlined into the following water use categories to reflect regional demand over time:

- Public and domestic water supply
- Irrigated agriculture
- Livestock
- Evaporation (includes stockpond and playa evaporation during 1975 and stockpond evaporation through 1985)
- Other (commercial, mining, power, industrial and, during 1975 through 1985, fisheries, military, and recreation)

Currently, surface water supplies less than 25 percent of demand in the planning region. Most of the current surface water use is for the Arch Hurley Conservancy District in Quay County, and surface water is also diverted from the Dry Cimarron River in Union County. Historical water use information indicates that the region relies primarily on groundwater, which is used mainly for agriculture. Domestic and municipal water use is supplied completely by groundwater in the region and accounts for a small percentage of total use.

Figure ES-6 shows total withdrawals in the planning region from 1975 through 2000. Current water use is relatively consistent throughout the Northeast Region, with agriculture as the largest use and public water supply accounting for a small percentage of total use (Figure ES-7). Evaporation accounted for 22 percent of water withdrawals in Quay County in 2000, due to Ute Reservoir (Figure ES-7).

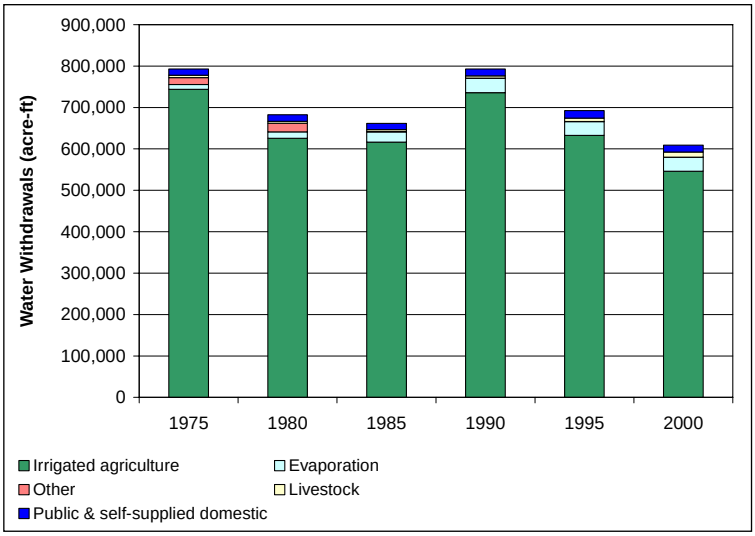

Figure ES-6. Historical regional water withdrawals

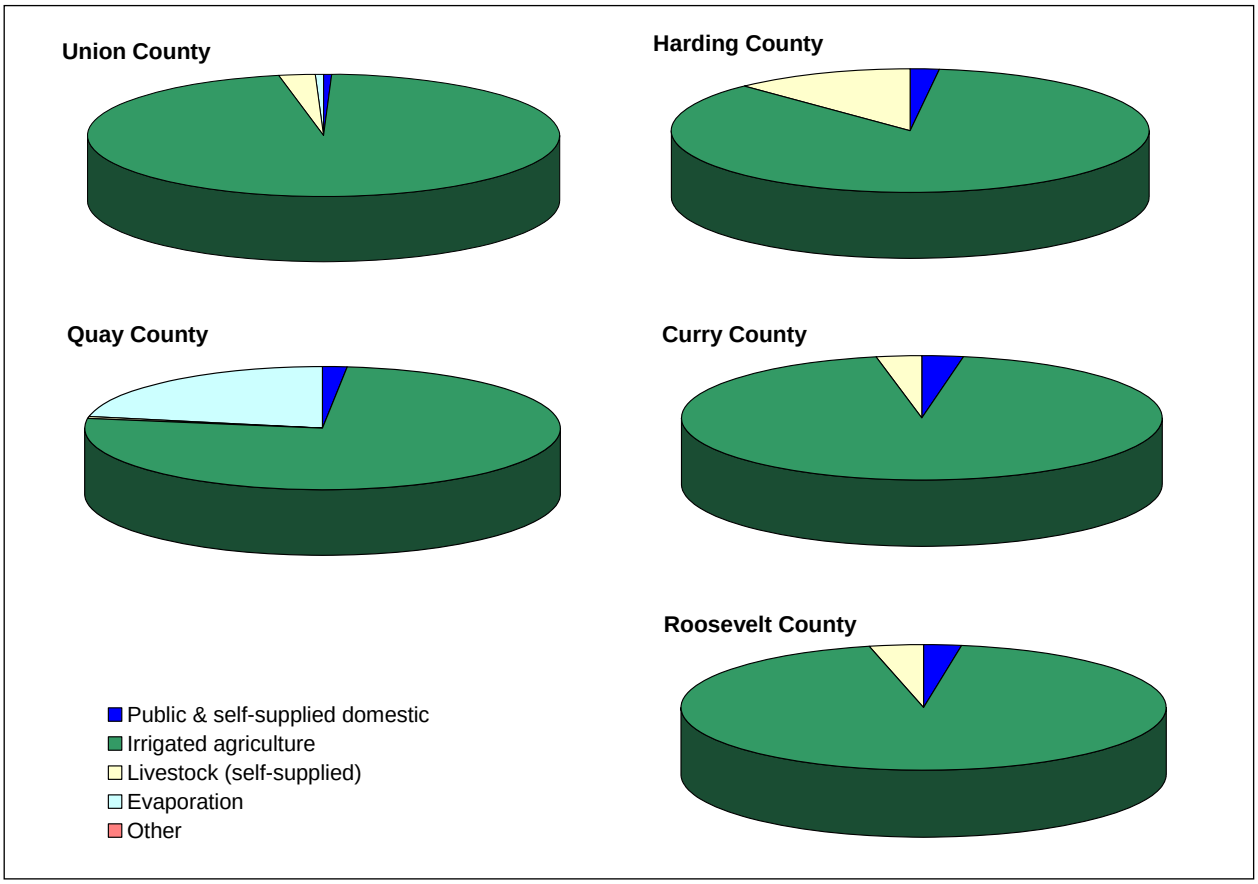

Figure ES-7. Water withdrawals by county, Year 2000

Population Projections

In order to plan for future water needs, regional water planners must estimate future population growth. Accordingly, population projections for the five counties in the planning region were developed based on information from interviews with selected community representatives, from historical population trends, and from Bureau of Business & Economic Research population projections. Based on this information, both high growth rate and low growth rate scenarios for future population development were determined.

In Union County, the high growth projections (Figure ES-8) assume that economic growth, as reflected in the County's job growth, continues as it has since 2000. The low growth scenario assumes that economic growth is at the slower rate that occurred from 1970 to 2000.

In Harding County, the high growth scenario (Figure ES-8) assumes that the County achieves its goal of creating jobs to retain its population over the next 40 years and achieves economic growth similar to that experienced in recent years. The low growth scenario assumes that the current trend of population decline continues, but that the rate of population decline slows in the future.

In Quay County, the high growth projections (Figure ES-8) assume that the local economy is reinvigorated, with a relatively slower rate of growth to 2010 that increases after 2010 and slows somewhat after 2030. Under the low growth scenario, population was projected to remain static.

In Curry County, the high growth scenario (Figure ES-8) takes anticipated changes at Cannon Air Force Base into account and assumes that new jobs are created at a rate commensurate with recent successes in attracting industry and retail businesses to the County. The low growth scenario also takes the anticipated Cannon Air Force Base changes into account, but assumes that new job creation occurs at a rate comparable to the long-term average.

In Roosevelt County, the high growth scenario (Figure ES-8) assumes that future economic growth is similar to recent trends. The low growth scenario assumes a slower growing economy, reflective of the trend from 1970 to 2000.

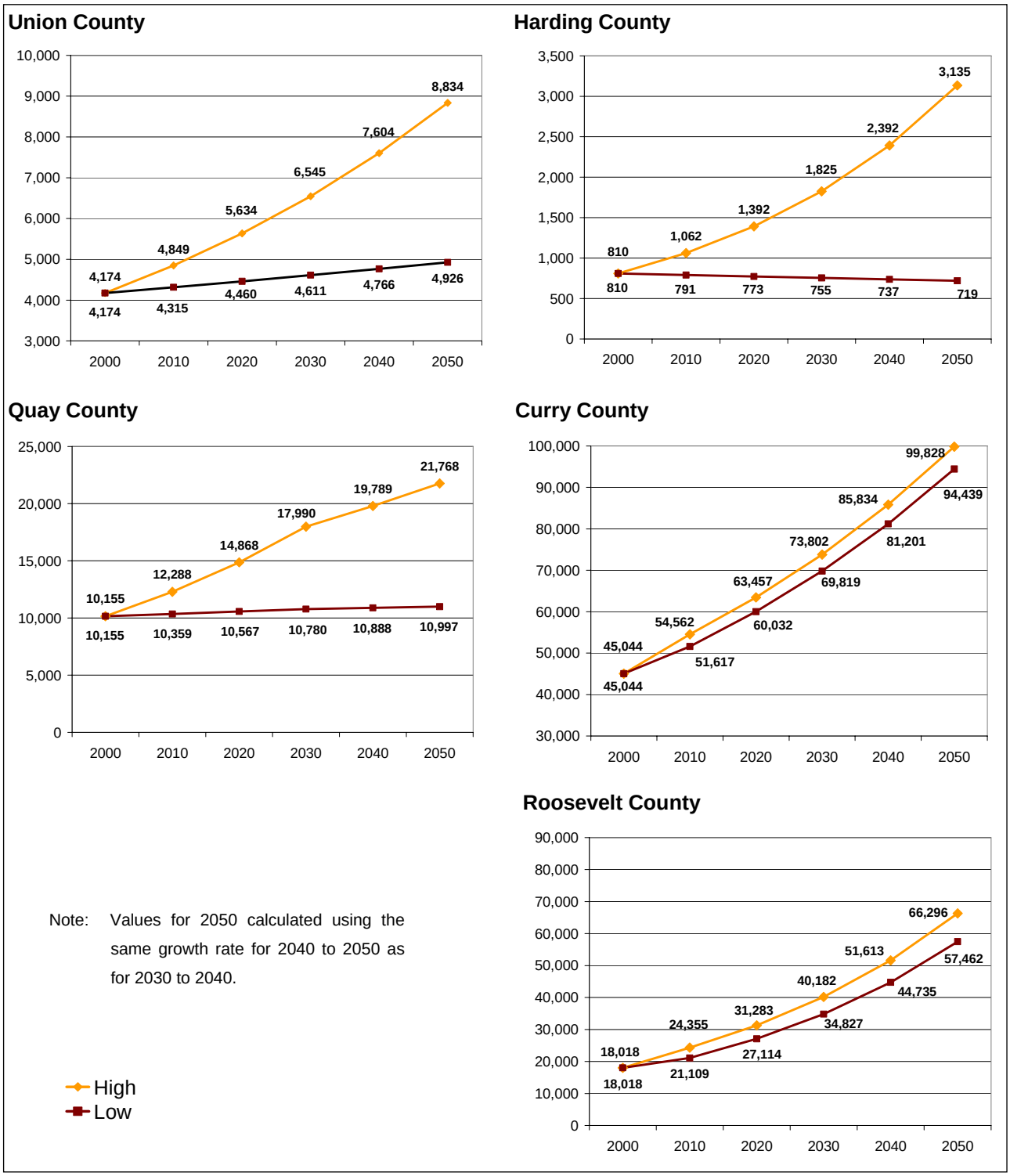

Figure ES-8. Projected population by county

Planning Region Population Projections

Under the low growth scenario, the population for the entire planning region of 78,200 is projected to increase by more than 90,300 residents, to a total of approximately 168,500, by 2050. Currently Curry County has the majority of the population and will maintain that majority under both the high and low growth scenarios. Under the high growth scenario, the increase is projected to be nearly 121,700, for a total of approximately 199,900 in 2050.

Water Budget

A water budget is a quantification of the amounts of water moving in and out of a specified subsystem of the overall hydrologic cycle. Water budgets show the amount of renewable water available compared to the demands on the system. The Northeast Region contains two major stream systems and all or parts of eight declared groundwater basins. Separate water budgets were developed for surface water, by river system, and for groundwater, by county.

Surface Water Budgets

Surface water budget analyses rely heavily on estimates of components instead of actual measurements. Although precipitation and streamflow are measurable water sources, they are typically measured at only a few locations. Evaporation, evapotranspiration by plants, infiltration, return flows, and spring and seep discharges are generally not measured directly and are therefore usually estimated. Consequently, surface water budget calculations generally have a high degree of uncertainty and should be used with caution.

Surface water budgets were prepared for the Dry Cimarron River from the gage near Guy to the state line with Oklahoma and for the Canadian River from Conchas Reservoir to below Ute Dam at the gage near Logan. Annual surface water budget results for representative average and drought years were prepared.

Analysis of the Canadian River water budget indicates that the supply is insufficient to meet demands in many years. Conservation efforts, particularly in the conveyance channels, could dramatically reduce losses and help farmers meet their irrigation requirements.

Analysis of the Dry Cimarron River water budget indicates that supply is generally sufficient to meet demands under median conditions, but that inflow is insufficient to meet demands during drought. The annual shortfall on the Dry Cimarron River during drought is much less than the shortfall on the Canadian River, at almost 2,500 acre-feet based on minimum historical flow.

Groundwater Budgets

Groundwater supplies more than 75 percent of the water used in the Northeast Region. The natural components of inflow, such as recharge, are generally not measured and are instead estimated from modeling studies or other analyses, thus creating uncertainty in the budgets. Nevertheless, groundwater budgets were prepared for each county in the region, using the best data available.

The groundwater budget analysis indicated that large deficits would occur in Curry and Roosevelt Counties. While more information on the amount of evapotranspiration, stream losses and gains, and sub-flow in and out of each basin is needed to obtain a better understanding of actual water budgets, these estimates can serve as useful planning tools for the region.

Comparison of Supply and Demand Projections

To determine the Northeast Region's practical ability to meet future water demand, DBS&A compared the projected water supply in each county to the projected demands.

- For groundwater, which provides most of the region's supply, the projected supply was determined based on estimates of the lifetime of supplies in existing wells, which are in turn based on existing water level trends. The projected supplies do not take into account potential new supplies or new water rights, reflecting rather conditions that would occur based on decline of the supplies in existing wells. For the four counties that use primarily groundwater, the comparisons indicated that, while projected supplies in existing wells are largely sufficient to meet projected demand in Harding County, they are insufficient to meet projected demand in Union, Curry, and Roosevelt Counties (Figure ES-9).

- In Quay County, which relies largely on surface water supplies, groundwater supplies are adequate to meet demands on that resource, but while surface water supplies are adequate in wet years, during average and drought periods, there may be shortfalls in meeting agricultural demands of the Arch Hurley Conservancy District. The surface water diversions for the Arch Hurley Conservancy District vary widely: while Arch Hurley has diverted more than 110,000 acre-feet in some years (e.g., 1999), in one recent year (2003), no water was available for diversion. The amount of water delivered to crops could be improved in drought years by improving the efficiency of the delivery system.

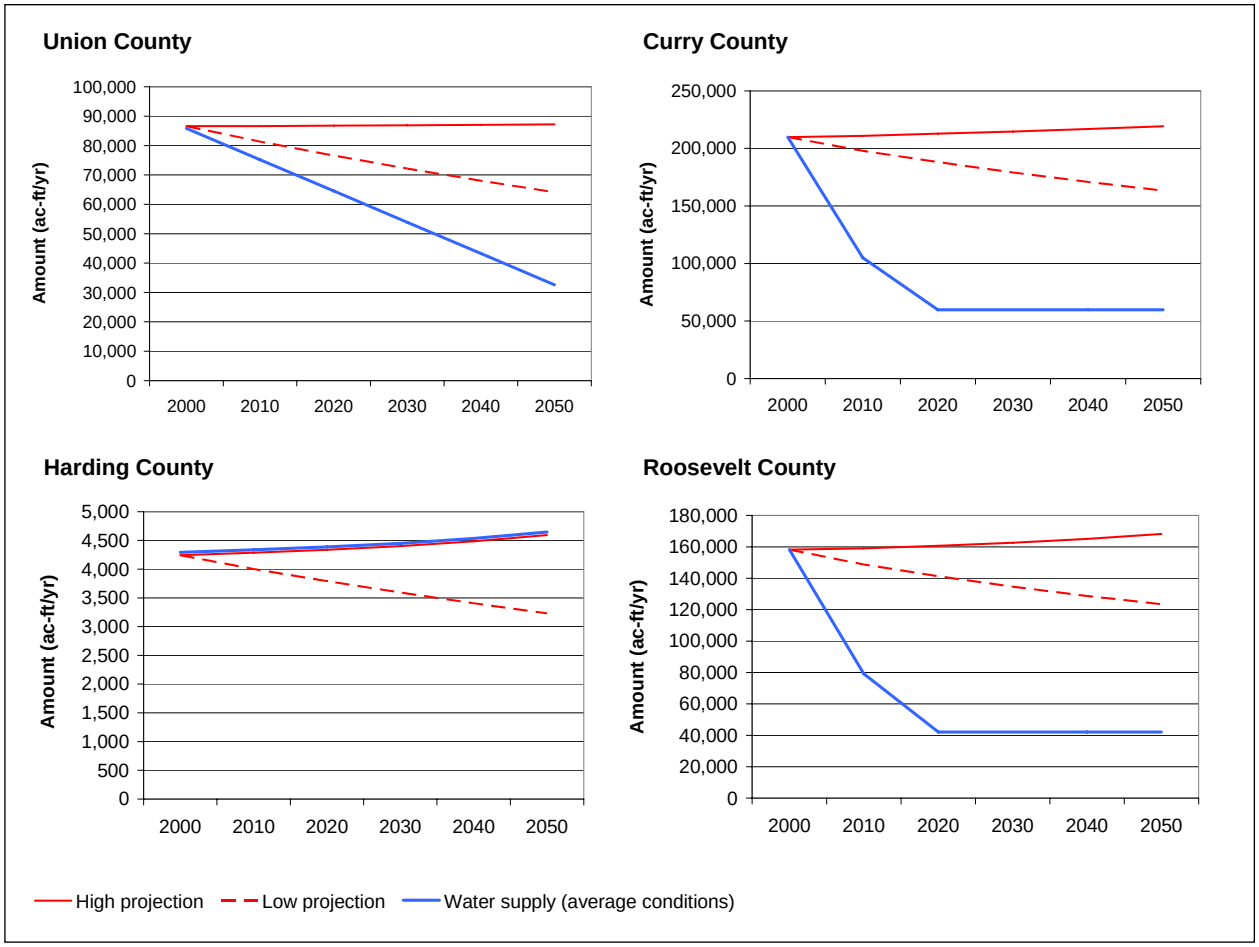

Figure ES-9. Projected diversions vs. groundwater supply by county

Strategies for Meeting Future Demand

Once the region has studied their water supply and projected future demand for water, the final component of regional water planning is to develop strategies for meeting the projected water demand. Strategies are actions that the region can take to increase supply, reduce demand, protect or improve water quality, or better manage water resources so that the water supply of the region continues to be viable.

An initial list of potential strategies was developed at steering committee meetings, which were open to the public, and at public meetings. The initial list of strategies was then presented at a series of community meetings around the region. The attendees at each meeting added to the list of strategies and, as a group, identified strategies that they considered to be most important for the region. Based on this input, the steering committee identified the following priority strategies for inclusion in the plan.

- Municipal conservation, including education, rate structures, and gray water use, to reduce the demand in public water supplies

- Agricultural conservation, including on-farm improvements such as more efficient irrigation systems and delivery system efficiencies such as ditch lining, to reduce demands for agricultural use

- Groundwater management, focusing primarily on water level and water quality monitoring and reporting

- Rangeland conservation and watershed management, focusing on grazing management and phreatophyte removal, to protect water quality, decrease erosion, and potentially reduce riparian depletions

- Water rights protection, including methods for protecting water rights and preventing out-of-region transfers

- Eastern New Mexico Rural Water System, the proposed pipeline to convey Ute Reservoir water to municipalities in parts of the region

- Infrastructure upgrades, including infrastructure needed for a new Village of Des Moines water supply or for a regional system serving the Villages of Des Moines, Folsom, Grenville, and Capulin

- Planning for growth, which analyzes possible implementation of policies requiring that adequate water supplies are available for growth

- Dam construction, which provides a legal analysis of the feasibility of building a dam or diversion to supply a Harding County water system with renewable supply

In accordance with the ISC template, these priority strategies were evaluated with regard to their technical feasibility, political feasibility, social and cultural impacts, financial feasibility, and hydrologic and environmental impacts. All of the strategies are possible to implement, but their costs and effectiveness vary depending on many variables. Building a dam or diversion would be the most challenging strategy to implement, while others will require only funding and the initiative of the region, with citizen participation, to implement.

Even if all the strategies are implemented, there will continue to be a gap between projected demands and supplies, due to the large amount of agricultural pumping from the Ogallala aquifer. This aquifer is declining in the eastern portion of the planning region, and economically developable supplies to replace the Ogallala have not been identified. The gap can be mitigated somewhat by the ENMRWS, which will provide an alternate municipal and industrial supply for communities involved in the project, and by implementation of aggressive agricultural water conservation measures, which will slow the rate of decline.