These modeling results point out that groundwater demands cannot be met (i.e., there is a gap) and the water levels will continue to decline, even under sustainable pumping conditions. This conclusion serves to highlight the importance of replacing groundwater with surface water to meet demands. The Grand Prairie and Bayou Meto projects are important because they will convert about 15 percent of the East Arkansas WRPR irrigated acres from groundwater to surface water.

The model is a regional-scale model that is not capable of assessing small-scale conditions, but does provide a reasonable means to assess the availability of groundwater at the scale of this study.

The availability of groundwater outside the MERAS model area is based on a qualitative evaluation of water supply availability completed by the USGS and described in the 'Aquifers of Arkansas: Protection, Management, and Hydrologic and Geochemical Characteristics of Arkansas's Groundwater Resources' (Kresse et al. in review) (Appendix D).[39]

The Interior Highlands of Arkansas have less reported groundwater use than other areas of the State, reflecting a combination of effects – prevalent and increasing use of surface water, less intensive agricultural uses, lower population and industry densities, lesser potential yield of the resource, and lack of detailed reporting.

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As such, the overall lower yields of aquifers of the Interior Highlands result in domestic supply as the dominant use, with minor industrial, small municipal, and commercial supply use. Where greater volumes are required for growth of population and industry, surface water is the greatest supplier of these water needs in the Interior Highlands.

Groundwater Quality

The information on groundwater quality comes entirely from the 'Aquifers of Arkansas: Protection, Management, and Hydrologic and Geochemical Characteristics of Arkansas's Groundwater Resources' (Kresse et al. in review).[40] Groundwater quality information was compiled from more than 500 historical and recent publications and from greater than 8,000 sites with groundwater quality data. The water quality data measurements were obtained from the USGS National Water Information System (NWIS) database and the ADEQ and entered into a spatial database to investigate distribution and trends in groundwater quality constituents for each of the aquifers. The water quality characteristics of 16 aquifers in Arkansas that currently serve or have served as important sources of water supply have been described.

The Mississippi River Valley alluvial aquifer is one of the most important aquifers in terms of total groundwater use in the State. Water quality generally is good throughout the extent of the aquifer; however, elevated iron concentrations in most areas preclude use of the aquifer for commercial, industrial, and municipal use without treatment. Elevated salinity additionally occurs in different areas of eastern Arkansas.

The Sparta aquifer is the second most important aquifer in terms of volume of use in Arkansas. Groundwater from the Sparta aquifer generally is of very high quality; isolated areas contain slightly elevated chloride concentrations resulting from upwelling of high-salinity water from underlying formations.

Other aquifers of the Coastal Plain – including the Cane River, Carrizo, Wilcox, Nacatoch, Ozan, Tokio, and Trinity aquifers – generally are used as important local sources of domestic, industrial, and municipal supply. These aquifers all exhibit increasing salinity at various distances downdip from the outcrop areas that renders the groundwater unusable for most purposes. However, where there is a higher percentage of sand in the formations comprising these aquifers, for example, in the northeast part of the State, the aquifers are of high quality and result in greater use.

The Interior Highlands region of western Arkansas has less reported groundwater use than other areas of the State. Spatial trends in groundwater geochemistry in the Interior Highlands differ greatly from trends noted for aquifers of the Coastal Plain.

In the Ozark and Springfield Plateaus, the high degree of connectivity between the surface and groundwater

[39] T.M. Kresse, P.D. Hays, K.R. Merriman, J.A. Gillip, D.T. Fugitt, J.L. Spellman, A.M. Nottmeirer, D.A. Westerman, and J.M. Blackstock, *Aquifers of Arkansas: Protection, Management, and Hydrologic and Geochemical Characteristics of Arkansas's Groundwater Resources*, U.S. Geological Survey (In Review, 2013).

– expressed in the occurrence of sinkholes, solution fractures, caves, losing streams, large springs, and other karst features – leads to nutrients, bacteria, and other surface-derived contaminants associated with agricultural activities posing the greatest threat to groundwater quality. A direct correlation was noted for increasing nitrate concentrations with increasing percentage of agricultural land use for the Springfield Plateau and Ozark aquifers.

6.1.4 Gap Analysis

This section describes the process for estimating the gaps between water availability and water demand and the infrastructure necessary to use the available water. Areas in the State with water supply gaps and an estimate of the magnitude of those gaps are identified. Infrastructure needs at the provider level are also described.

Methodology and Approach

To determine the water supply gaps, two types of water sources were analyzed throughout all the AWP technical studies – surface water and groundwater. Both of these sources were evaluated to determine where the most significant potential for supply limitations may exist in the future. The methodology for calculating excess surface water and total surface water available were described in Section 6.1.2.

Groundwater gaps were calculated as a function of modeled groundwater yields for areas within the MERAS model. Groundwater gaps for the State are based on projected changes in groundwater demands. In areas where a groundwater gap is projected, the gap analysis assumes the surface water could be used to fill the groundwater supply gap. A combined source gap occurs when there is insufficient excess surface water or total available surface water to fill the groundwater supply gap. Conversely, a combined source surplus occurs when more supplies are available than are required to meet all demand within a river basin. For all areas, even those where no combined source gap is projected, it is important to note that the appropriate infrastructure may not be in place to utilize all of the available supply.

The infrastructure gap was assessed based on surveying State, public water, and wastewater providers within the State. The survey collected information on planning efforts, asset management and strategies, current and planned funding sources, and estimated costs to meet the identified needs. The infrastructure survey was sent to all 699 public, community providers in the ANRC database. Of the 699 surveys distributed, 261 providers responded to the survey, for an overall response rate of 38 percent, representing an estimated 67 percent of the population with supplied water and wastewater services. Response rates were representative across regions and providers of different sizes, ensuring that the survey data was representative of different provider circumstances and needs across the State. Overall, $5.74 billion in infrastructure needs was identified through 2024 for all water providers. Similarly, wastewater providers are estimated to need $3.76 billion in infrastructure improvements through 2023.

Results

The annual average 2050 groundwater gap across the State is estimated to be approximately 8.2 million AFY assuming sustainable groundwater pumping. On an annual average basis there is "excess surface water" and "total available surface water" in every major river basin; on a monthly basis the projected excess and total available surface water varies seasonally such that there is less available in the high demand months of June, July, and August.

At the major basin level, the results of the water supply gap analysis are summarized below and shown in Figure 6-7. All groundwater gaps are based on the assumption of sustainable pumping:

- **Arkansas River**—the Arkansas River Basin has a projected groundwater gap of over 750,000 AF in 2050; however, due to the substantial amount of excess surface water and total available water in the basin, there is a combined source surplus that ranges from 2,500,000 AF to 12,500,000 AF depending on the amount of surface water assumed available for development. An insignificant groundwater gap was identified for just the upper portion of the Arkansas River and a substantial combined source surplus was identified due to large amounts of available surface water supplies available in this upper portion.