

## **APPENDIX G**

# **REGIONAL WATER SUPPLY CAPACITY AND DEMAND PROJECTIONS**

East Locust Creek Reservoir Project  
Regional Water Supply Capacity and Demand Projections

April 2013

The purpose of this document is to evaluate the need for additional water resources on a regional basis. It includes all sources of raw water in the region and demonstrates that the region needs more sources. It is not intended to set the amount of water that is needed from the North Central Missouri Regional Water Commission but to establish the fact that the region as a whole will not be able to meet its needs without additional sources.

Because the East Locust Creek Reservoir project is seen by Missouri Department of Natural Resources as a major component of their public water supply regionalization plan it was deemed appropriate to take a regional view towards evaluating capacity for total raw and unfinished water supply during periods of drought. As described below, even when all existing regional sources of water are accounted for, there is a clear need for additional water supply sources in North Central Missouri. This highlights the fact that the East Locust Creek Reservoir should be thought of as just one major component of a regional plan the needs to include additional new sources.

Based on the Water Use Study developed by Everett Baker with Missouri Department of Natural Resources (Everett Baker, 2004) and on the Burns and McDonnell Feasibility Study, the region shown in Figure 1 was delineated for a possible water supply interconnection phasing plan. The region which roughly equates to the 10 county region commonly considered to be the East Locust Creek Reservoir service region, was broken into sub-regions (Figure 2) based on the existing interconnections and the relative difficulty in connecting to them. Because each sub-region includes its own sources of water and there is potential for raw and/or finished water to flow each way along any given interconnect, this analysis includes consideration of both sources and demand in each region. This region is bounded by the Cannon Wholesale Water Commission to the east, the Great Northwest Regional Water Commission to the West, the Rathbun Regional Water Association to the North and the Missouri and Grand rivers to the South and South West.

It is our opinion that this region should be served by some mix of existing and possibly new associations and that this region should have its water sources and water treatment facilities distributed throughout. By setting up the region in this manner the volume of water that is transported long distances is minimized, while redundancy during periods of drought or other emergencies is maximized for a secure water system with high reliability.

The 2013 Water Census (Missouri Department of Natural Resources, 2013) was used to develop estimates of current demand and capacity for each individual water system within the region. The Census reports capacity for each system as well as the percentage of their supply that is purchased. For

systems that report that some portion of their supply is purchased, the reported capacity is reduced by the purchased percentage to avoid double counting of capacity.

However, the Water Census is intended only to report conditions during typical years. It was not intended to predict capacity during periods of drought. To adjust for drought conditions, it was assumed that groundwater supplied sources would not be affected by the drought. This may not be a very realistic assumption given that all the groundwater sources in the area are relatively shallow, but we have no well documented method of estimating their true capacity during droughts. We do know that the only relatively major groundwater source in the region, Chillicothe, which draws water from shallow alluvial wells in the Grand River bottoms was able to supply all that was needed during the drought of 2012.

The Department of Natural Resources Water Supply Study (Missouri Department of Natural Resources, 2011) serves the purpose of evaluating the capacity of surface sources in northern Missouri during periods of drought. This study models each existing reservoir in the region during a drought similar to the drought of the 1950s to determine how much water the reservoir could supply during a drought. The study also analyzes the supply capacity of the Trenton water supply which is a surface intake in the Thompson River. Data from this report was available for all surface supplies in the region, so the drought capacity from this report was used as the available capacity for surface water based systems.

In recognition of the idea that water supplies tend to degrade over time, the capacity change between the earliest online Water Census (2006) and the 2013 Census was used to calculate a rate of degradation of water supplies in the region of 0.22% per year.

Water demand numbers were taken from the 2013 water census directly. To get a feel for the range of conditions, calculations were performed at 1% and 2% water usage growth rates. The DNR reports mentions some rates that are significantly above this range and some that are below. It is expected that the reservoir and the availability of plenty of water will lead to increases in usage above current.

The results of these capacity and demand calculations for the entire region with and without East Locust Creek Reservoir are shown in figures 3 and 4. It is assumed, for a worst case basis, that when the East Locust Creek Reservoir is brought online the Elmwood Lake supply will no longer be available. Some scenarios that have been discussed include this possibility and predicting whether Elmwood Lake will remain in service is beyond the capacity of this study. So the increase from East Locust Creek Reservoir is assumed to be 4.2 MGD instead of the full 7.0 MGD.

The phasing of interconnecting these areas is going to have to be done gradually as the sub-regions recognize the need for more water or more redundancy. The actual dates of these future connections are not possible to predict, but we need to develop a phasing plan to meet regulatory requirements. So, based as best we can on what we know about the different regions current needs and the costs to connect we have developed the following phasing plan .

Figure 1. East Locust Creek Reservoir Service Area from 2004 Water Use Study

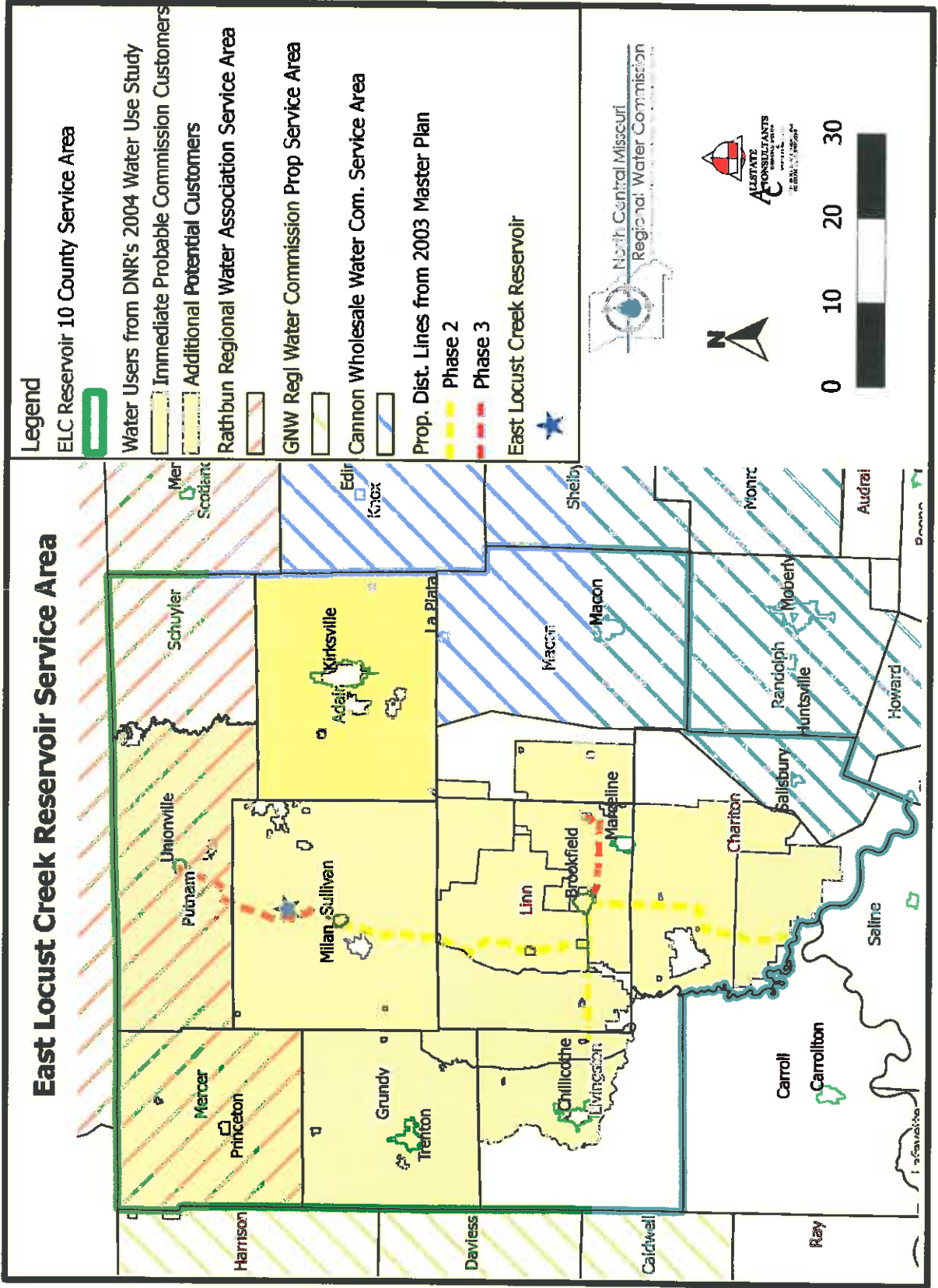
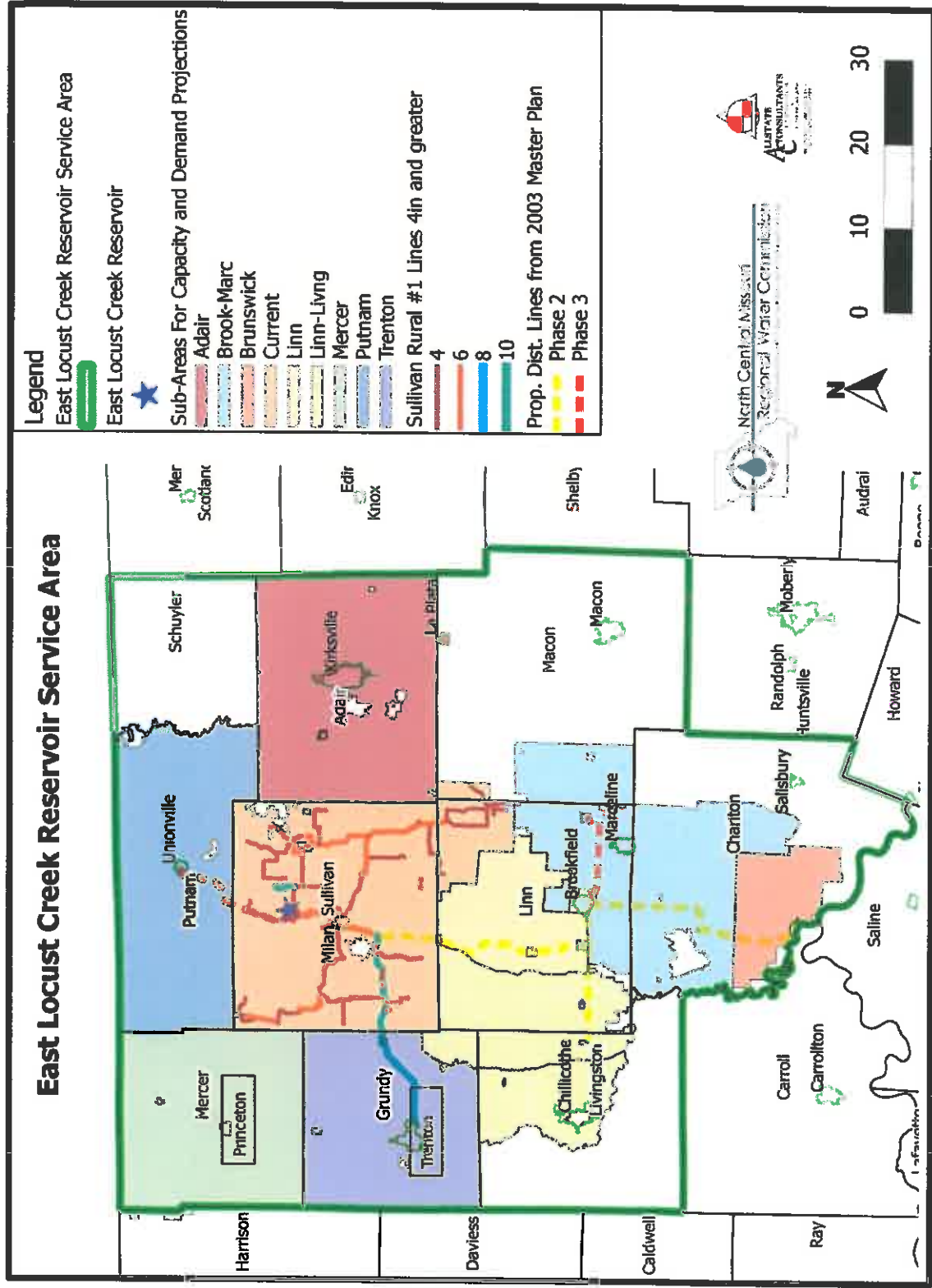


Figure 2. Study Sub-Regions of the East Locust Creek Reservoir Service Area



<b>Subarea</b>	<b>Year Connected</b>
Current	2013
Trenton	2013
Linn	2018
Putnam	2018
Brookfield-Marceline	2025
Linn-Livingston	2025
Mercer	2025
Adair	2030
Brunswick	2050

Phased projections were developed based on this phasing plan and are shown in figures 5 and 6.

Figure 3a. Projections for the Entire Study Region without East Locust Creek (1% growth)

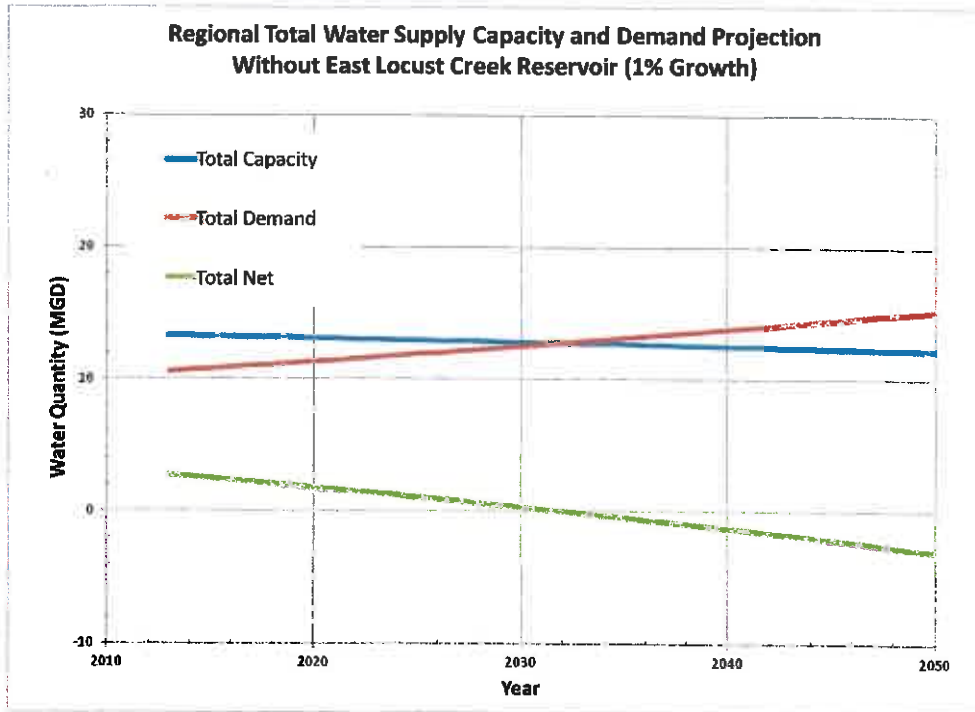


Figure 3b. Projections for the Entire Study Region without East Locust Creek (2% growth)

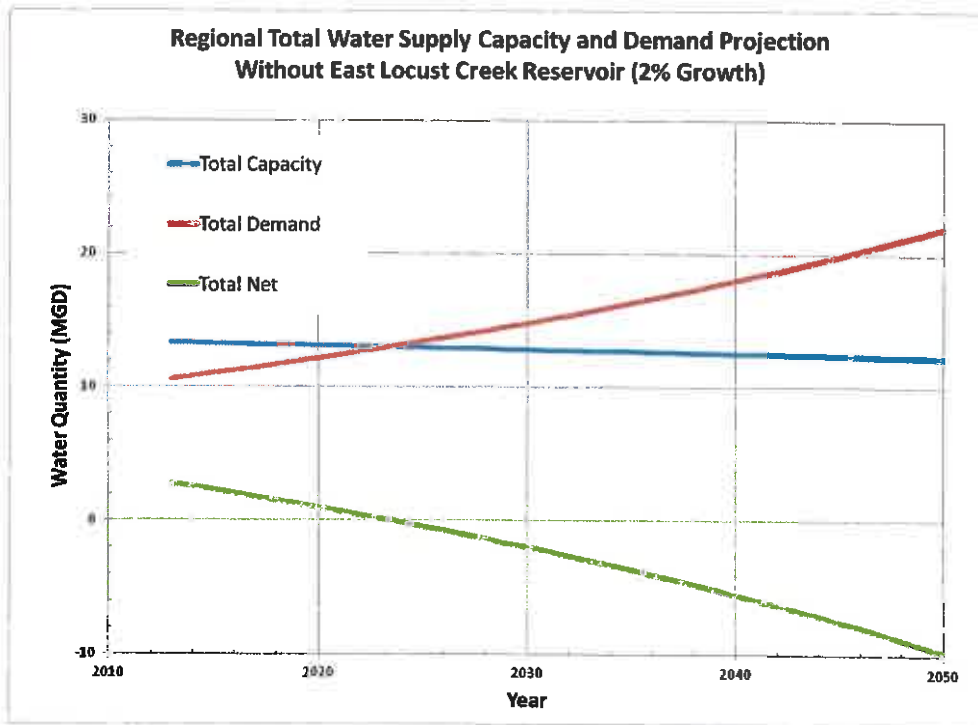


Figure 4a. Projections for the Entire Study Region with East Locust Creek Reservoir replacing Elmwood Lake. (1% Growth)

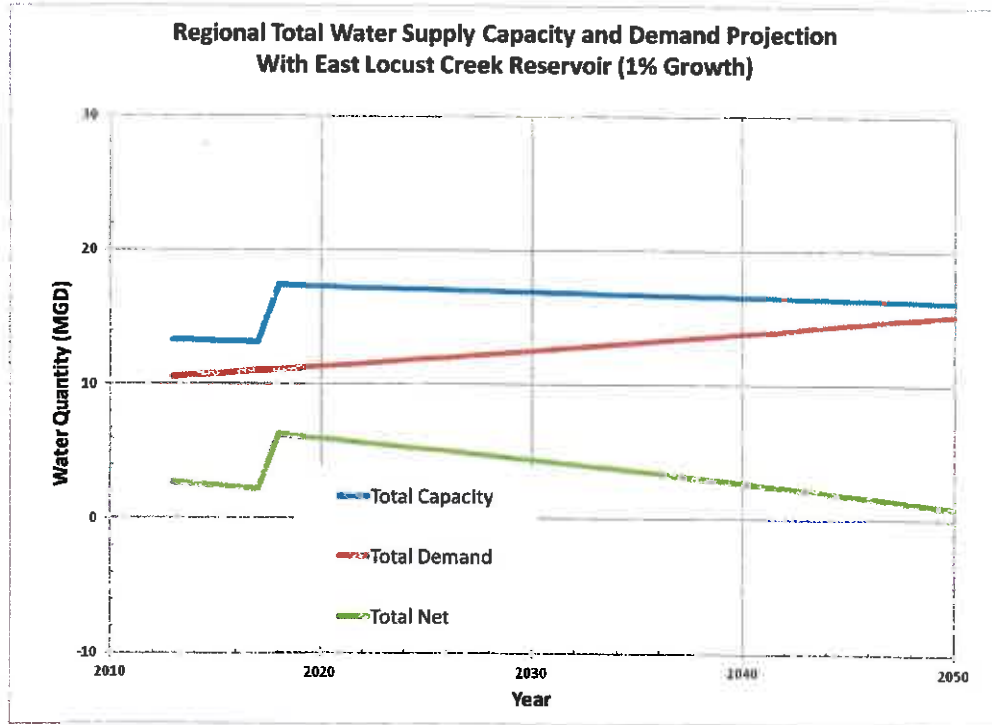


Figure 4b. Projections for the Entire Study Region with East Locust Creek Reservoir replacing Elmwood Lake. (2% Growth)

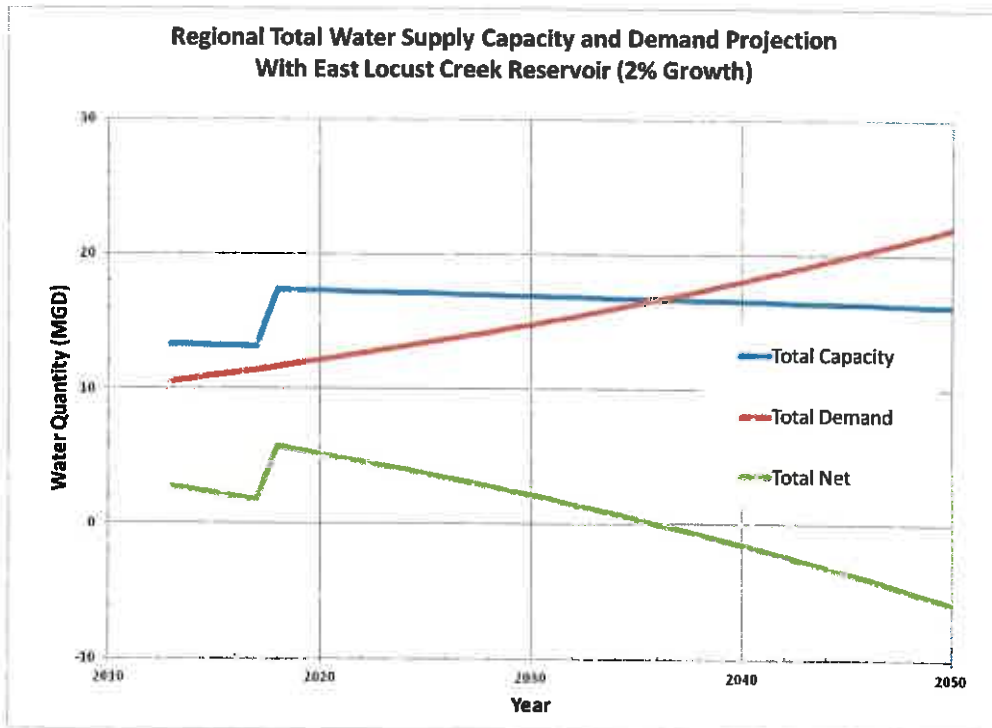




Figure 5a. Projected Phased Demand and Capacity for Systems Connected by the draft phasing plan without East Locust Creek Reservoir (1% Growth).

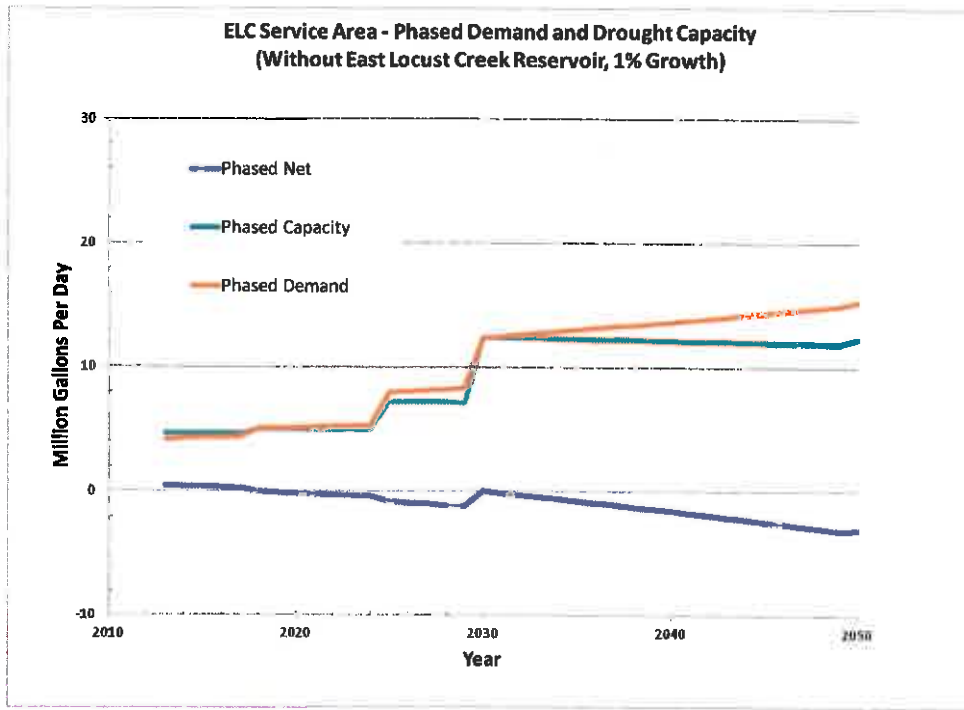


Figure 5b. Projected Phased Demand and Capacity for Systems Connected by the draft phasing plan without East Locust Creek Reservoir (2% Growth).

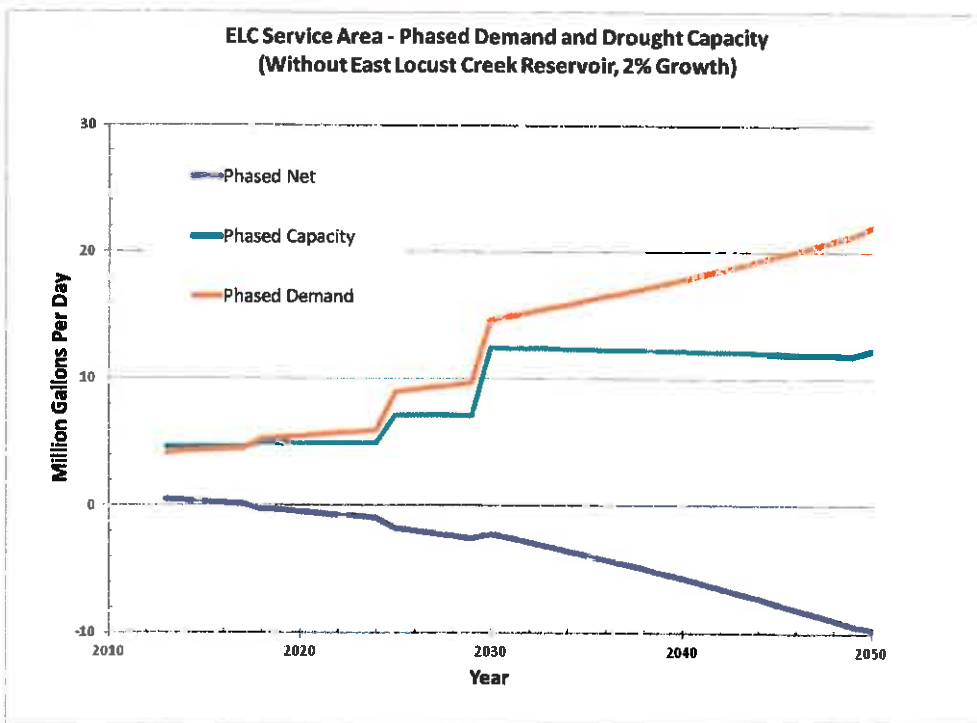


Figure 6a. Projected Phased Demand and Capacity for Systems Connected by the draft phasing plan with East Locust Creek Reservoir. (1% Growth)

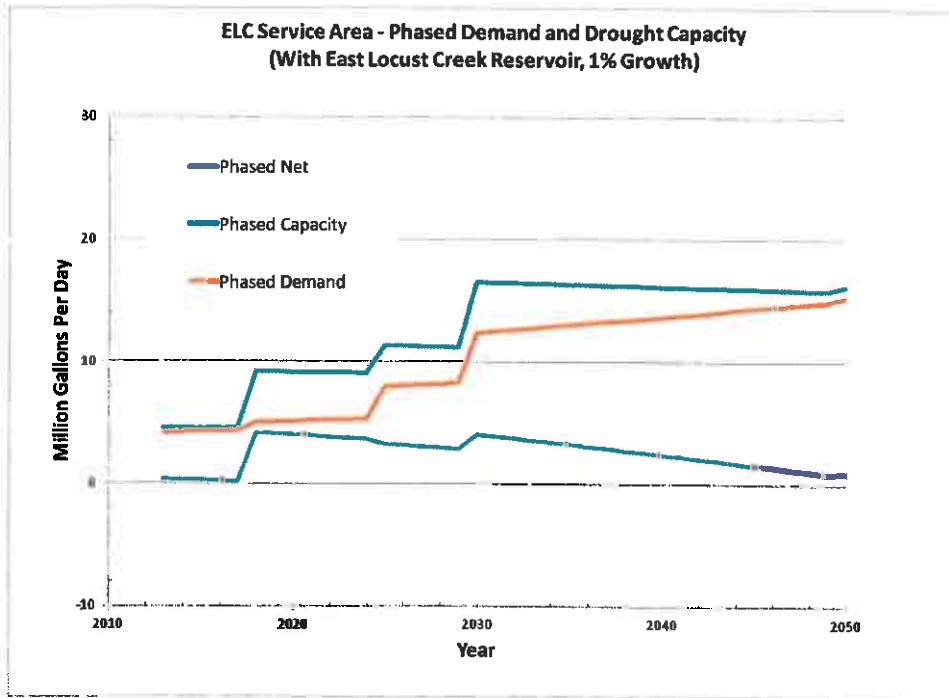
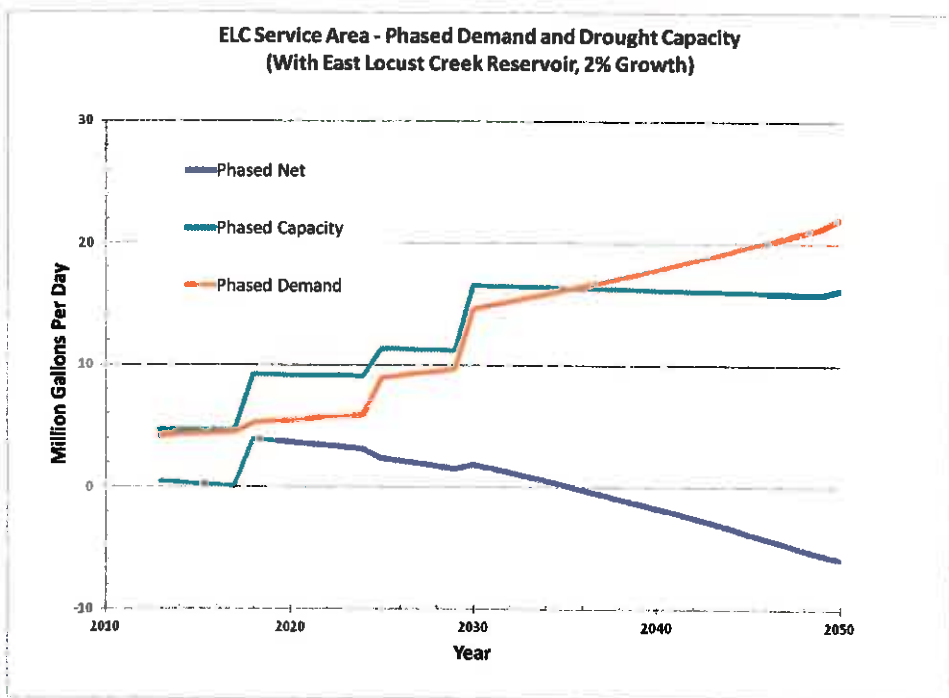


Figure 6b. Projected Phased Demand and Capacity for Systems Connected by the draft phasing plan with East Locust Creek Reservoir. (2% Growth)



## **Bibliography**

Everett Baker. (2004). *Water Use Study - North Central Missouri Regional Water Commission*. MoDNR.

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