Water in the Bucket – With a Straw

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Introduction

As we approach 2005 and the 79th Texas Legislature, a commonly asked question is, "*Does Texas really have a shortage of water supply*?" The answer is not so simple.

It depends.

It depends on what you mean by a shortage of water supply. It depends on what area of the state you are referencing. It depends on the climatic conditions (drought versus normal). Perhaps most importantly, it depends on whether the supply is based on total water that ***may*** be available (both surface water and groundwater) or, alternatively, on water supply that ***is*** available (infrastructure exists to treat and deliver water to the user).

The 2002 State Water Plan, *Water for Texas – 2002*, projects that available supplies will no longer be sufficient to meet water supply demands as early as 2010 if no new supplies are developed with the associated infrastructure to treat and deliver the water. This analysis, however, is based on statewide totals, in which the eastern water-rich regions tend to mask the shortages of the more arid western regions of the state. If available supplies are evaluated on a more detailed level, then 438 cities and major water users would have had insufficient water supplies to meet water supply demands had there been statewide drought conditions in 2000. This number is projected to grow to 883 if no additional conservation measures are implemented, and no new water supplies and associated infrastructure are developed by 2050.

Armed with the knowledge of what our water supply needs are along with projections of water demands, we are then able to identify solutions to ensure that there is enough water for Texas' future. These solutions include developing additional surface water and groundwater supplies, conservation, reuse, and desalination.

Texas is now a nationally and internationally recognized leader in water planning. We now have a much more thorough and comprehensive understanding of the water supply needed to provide for Texas' growing and dynamic future. The purpose of this paper is to address the following questions:

- How did Texas achieve its understanding of our need for additional water supplies?
- How much water and associated infrastructure does Texas currently have to meet those needs? In other words, how much water does Texas have in the bucket, with a straw in hand, to deliver that water?
- Finally, what potential role will desalination have in meeting water supply needs?

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Background

In 1996, over 300 water utility systems were placed on the state's "critical list," primarily due to insufficient water supplies resulting from the statewide drought experienced during that spring and summer. This relatively short drought with its resulting severe water supply shortages served as the primary catalyst for the 75th Texas Legislature's enactment of Senate Bill 1 (SB-1) in 1997, probably the most significant water-related legislation to be passed in Texas for at least several decades. A major component of SB-1 was the establishment of a regional water supply planning process. This grassroots planning process has been an incredibly challenging and dynamic process, which resulted in the 2001 Regional Water Plans and the 2002 State Water Plan. As we approach the conclusion of the second round of regional water planning, which will result in the 2006 Regional Water Plans and the 2007 State Water Plan, we have found that once again this process has significantly improved and enhanced our understanding of Texas' water supply and the state's recognition of the need to meet future demands.

Water in the Bucket – With a Straw

There are multiple ways to describe available water supplies. In any technically based discipline, it is often inevitable that more descriptive phrases will evolve to explain, in a shorthand way, what is in reality a complex analysis. The shorthand phrases utilized in this discussion meet this test; very simple descriptive phrases to illustrate what in reality are very complex systems, both naturally occurring and as modified by man.

"Water in the bucket" is used here to describe the total volume of water available for use regardless of whether or not there is infrastructure to deliver that water. Guidelines developed for the regional water planning process are somewhat complex with respect to how this evaluation is performed. In its simplest terms, "water in the bucket" is the total amount of water that can theoretically be reliably withdrawn from a surface-water reservoir, a run-of-the-river diversion, or an aquifer, during drought conditions.

"Water in the bucket – with a straw" is used to describe the amount of water that can be withdrawn using existing infrastructure from a surface water reservoir, a run-of-the-river diversion, or an aquifer during drought conditions. One additional qualifier to this definition is that the volume of water that may be withdrawn from an aquifer may also be further limited by policy decisions of groundwater conservation districts and regional water planning groups and also by limits on pumping set through regulations by groundwater conservation districts.

It is important to note that, volumetrically, the more restrictive term is "water in the bucket – with a straw." An example would be a surface reservoir for which a city owns all of the permitted water rights, but for which the city has no existing infrastructure (transmission pipeline or treatment facilities). A city with a large holding of groundwater rights but no well field or transmission pipeline is an equally appropriate example. For both of these cities, without the infrastructure, there is no water supply available to the city to meet current water supply needs.

The 2002 State Water Plan estimates that groundwater supplies available through existing infrastructure and within regional water planning group policy and groundwater conservation district policy and regulations are:

- 8.8 million acre-ft in 2000 and
- 7.2 million acre-ft in 2050.

Similarly, surface water supplies as limited by existing infrastructure are:

- 8.6 million acre-ft in 2000 and
- 7.0 million acre-ft in 2050.

The total water in the bucket with straw is:

- 17.4 million acre-ft in 2000 and
- 14.2 million acre-ft in 2050.

When compared with projected demands for water,

- 17 million acre-ft in 2000 and
- 20 million acre-ft in 2050,

It is clear that there will be a need for additional water supplies. When comparing projections of water demands with available water supplies on a water user basis (cities and rural areas outside of cities, irrigated agriculture, manufacturing, mining, steam-electric power generation, and livestock), the needs for additional supplies are

- 2.4 million acre-ft in 2000 and
- 7.5 million acre-ft in 2050

Note that the 2000 figures are somewhat misleading. Even though the sum of surface water and groundwater supplies (17.4 million acre-ft) is greater than the projected demands (17 million acre-ft) for 2000, the numbers do not reflect the needs of locations without adequate supplies during droughts. This is especially the case in the western half of Texas.

More straws

Through the regional water planning process, the regional water planning groups identified more "straws," officially termed water management strategies, to put in the bucket. These strategies include additional surface water and groundwater supplies, conservation, reuse, desalination, and others. Most of the strategies for increasing supplies involve additional surface and groundwater amounting to 77 percent of the extra volume of needed water. Conservation and reuse account for another 19.3 percent. Because the planning process occurs on a five-year cycle, regional water planning groups, and thus the state, are able to respond to changed conditions and new technologies such as desalination for meeting water supply needs.

Role of Desalination in Meeting Texas Future Water Supply Needs

As a water management strategy, desalination has many advantages. For one, it is a drought-proof supply. The Gulf of Mexico and brackish groundwater do not depend on climate for their existence and availability. Another advantage is the volume of water. The Gulf of Mexico is, for all practical purposes, an infinite supply. Recent studies suggest that there is over 2.5 billion acre-ft of brackish groundwater available in Texas. Desalination along the Gulf Coast will support economic growth in these areas and will allow for the potential sale or lease of downstream water rights in the state's rivers upstream to alternative locations, benefiting inland cities and water users.

In the past, desalination has not been seriously considered because of costs. But due to improvements in filter technology as well as greater efficiencies in the treatment process, desalination, under certain circumstances, is beginning to be competitive with other strategies for meeting future water needs. This is particularly important in West Texas where there are greater needs without adequate supplies. An abundance of brackish groundwater should afford West Texas communities and water users the opportunity to meet their water needs with desalination.

Conclusion

Texans face a great challenge as we work to meet our future water supply needs. The regional water planning process has documented that those needs occur throughout the state, particularly in large metropolitan areas and in the western half of the state. If we are to meet those needs we must utilize all available strategies that are determined to be cost effective and environmentally sound, or in other words, we must use all the tools in the toolbox. As the technology of desalination continues to improve, both in respect to the cost and as solutions to environmental concerns are successfully addressed, it is clear that desalination will be a very important tool that Texans will use to meet our future water supply needs.