Chapter 3
Fifty Years of Water Planning in Texas

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The year 2007 represents the 50th anniversary of the creation of TWDB, established in part in response to the drought of the 1950s. The 2007 State Water Plan is the eighth water plan developed by TWDB as a part of its core mission to ensure that sufficient, clean, and affordable water supplies are available for the citizens of the State of Texas and that those water supplies foster a healthy economy and environment. This chapter is a brief historical perspective of water planning in Texas over the past half century.

3.1 Creation of the Texas Water Development Board

Throughout the 20th century, oil played an almost mythical role in Texas history and popular culture, but water has always been the true lifeblood of the state. Water sustains our cities, farms, ranches, and industries, nourishing a diverse range of ecosystems, from the arid mountains and high plains of West Texas to the pine forests and bayous of East Texas. Unfortunately, the state is prone to climatic extremes—often alternating between floods and droughts. In other words, there can be either too much water for a short time or not enough for an extended period.

Droughts have always been a problem, but the one that plagued Texas in the 1950s was particularly devastating. It was, in fact, the worst in our state's recorded history or the "drought of record." For Texas as a whole, the drought of record lasted from about 1950 to 1957. By the end of 1956, 244 of Texas' 254 counties were classified as disaster areas. Ironically, the drought ended in 1957 with a flood that saturated the ground, returning soil moisture conditions to normal and replenishing depleted surface water reservoirs and aquifers.

The severe effects of the drought rallied citizens and lawmakers to take action to protect Texas communities from future drought and to ensure that the state's water supplies were both dependable and adequate enough to sustain and promote future economic development. In 1957, the Texas

As a boy growing up on a ranch at the edge of the West Texas oilfield, I learned the value of water at a tender age. Our drinking water was hauled from a deep well ten miles away. The new boomtown of Crane had not yet installed a waterworks, so early residents kept a barrel in front of their house or tent and paid a dollar to have it filled from a wagon or truck. By contrast, crude oil at the time was worth between ten and twenty cents a barrel.

Cost made the Texans prudent in their use of this precious commodity. Saturday night bath water served several family members, one at a time.

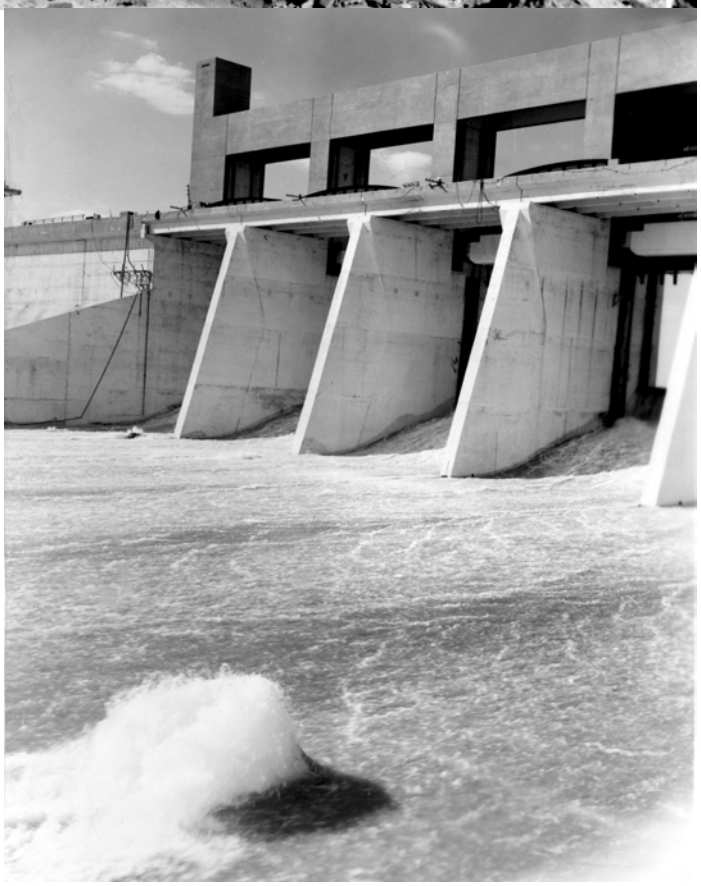
Today water is Texas' most serious long-range challenge. A rapidly growing population faces a finite supply of water. In the past the answer was simply to build another dam or drill more wells, but specialists agree the state has already developed most surface sites suitable for major storage. As for underground water, its availability varies widely and in too many places is declining at a worrisome pace.

Many towns and cities have experienced the necessity of water rationing during Texas' all-too-frequent droughts. Even in the more favorable years, we are becoming conscious of the need to conserve water for the droughts we know will come. Farmers and ranchers are well acquainted with springs and streams that go dry and with stock tanks that turn into dusty basins of dried and flaking mud. Most Texas aquifers' recharge rates lag far behind the rates of pumpage. Many irrigation wells have been deepened so many times that it is no longer economically feasible to pump them. All forms of life depend upon water. Without it, nothing can live. We as a state can no longer afford to continue mining our irreplaceable aquifers without thought to the future, to generations yet unborn and the drought years they are certain to face.

We Texans will leave a rich historical and cultural legacy to our descendants. But it will mean little if we leave them without water.

By Elmer Kelton

Texan, rancher, farm and ranch newspaper editor and journalist, published author of over 40 novels (including *The Time it Never Rained*), recipient of numerous awards for excellence in western literature, and a proclaimed "Texas Legend" by Texas Governor Rick Perry, Elmer Kelton understands Texas and the importance of water. Mr. Kelton lives in San Angelo.



Legislature created the Texas Water Development Board (TWDB), and the voters of Texas subsequently approved a constitutional amendment authorizing TWDB to administer a $200 million water development fund to help communities develop water supplies. In the same year, the legislature mandated that Texas begin a formal process for developing a plan to meet the state's future water needs. Thus, statewide water planning began in earnest in 1957 and has evolved over the years into one of most dynamic and innovative approaches to water management in our nation.

3.2 Evolution of Texas Water Planning 1957–2007

Prior to the allied invasion of Europe in 1944, Dwight D. Eisenhower said, "*The Plan is nothing. Planning is everything.*" At first glance this may seem illogical, but his point was that any particular plan is imperfect in its application. The real value is in the preparation that goes into creating a plan and refining it as events unfold. Plans and the planning process evolve through time as the world and people change. Problems become better understood. More information becomes available, and new ideas emerge. Water planning is no different: it is an iterative and dynamic process. TWDB has prepared eight water plans over the past 45 years.[1] While some elements of each plan have become reality, others have remained ideas only. But as the planning process continues and improves, people make more informed decisions, and each plan builds upon previous ones, better reflecting current social and environmental conditions.

The first two state water plans, adopted in 1961 and 1968, were initial attempts to describe Texas' water resources, to quantify how much water the state had and how much it needed in the future, and to propose ways to meet our future water needs. Both plans emerged during the nation's dam and reservoir construction era. In the early and middle 20th century, reservoirs reigned supreme in the world of water resources management. Not only did dams control floods, but they also served other important purposes. Dams could generate a cheap source of renewable energy, and reservoirs provided water supplies for cities, farms, and industries, as well as recreational opportunities, such as fishing and boating. The 1961 State Water Plan recommended 45 new reservoirs. The 1968 plan recommended 62 new reservoirs and addressed issues surrounding drainage, water quality, recreation, and fish and wildlife.

In the United States the big dam era lasted from about 1930 to 1980. The pace of reservoir construction began to slow in the 1970s and has since waned considerably because of environmental and funding constraints, new approaches to planning, and a lack of high-quality sites on which to

[1] The predecessor agency to TWDB—the Texas Board of Water Engineers—adopted the first plan in 1961. TWDB has prepared and adopted the 1968, 1984, 1990, 1992, 1997, and 2002 State Water Plans.

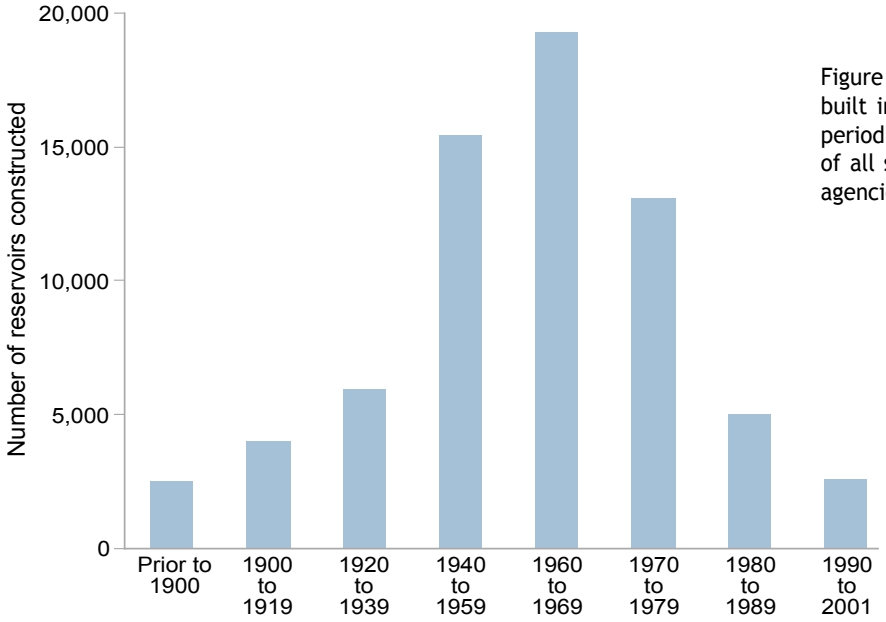


Figure 3.1. The number of reservoirs built in the United States by time period. This figure includes dams of all sizes recorded by regulatory agencies (Gleick, 2000).

develop reservoirs.[2] For example, from 1970 to 1979 a total of 13,076 dams were constructed throughout the nation (Figure 3.1). From 1980 to 1989 only 5,017 were built, and the downward trend continued through the 1990s. Texas followed the same pattern (Figure 3.2). Today, the state has 196 reservoirs with storage capacities of 5,000 acre-feet or more. Of these, 169 (87 percent) were constructed prior to 1980, and only 25 major reservoirs have been built in Texas since 1980. The de-emphasis on reservoirs as a primary means to meet our state's need for water was apparent in plans adopted after 1980. For example, the 1984 State Water Plan identified 65 major reservoir sites and allocated 44 of the new reservoirs to meet water needs through 2030. The 1990 State Water Plan included 20 new reservoirs, and the 1997 and 2002 water plans each recommended only eight new reservoirs.

In the 1980s and 1990s, Texas water planning evolved in several important ways. For one, there was a clear shift away from large-scale structural solutions such as dams. Instead, planners began to focus more on improving the management of the state's existing water supplies and infrastructure. Overall, there emerged a greater focus on reducing water use through conservation, reusing treated wastewater from homes and businesses, converting salt and brackish water to freshwater (desalination), and relying on other less conventional and more innovative approaches.

These changes were first evident in the 1984 and 1990 plans and became more apparent in the 1997 and 2002 plans. For example, plans prior to

[2] Dams and reservoirs in the United States currently store about 60 percent of the entire average annual river flow of the nation (Gleick, 2000).

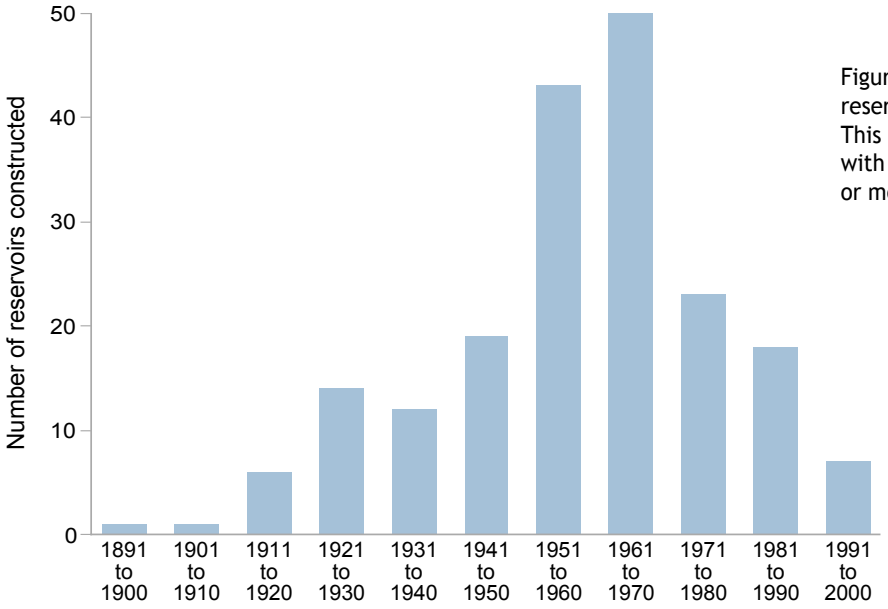


Figure 3.2. The number of reservoirs built in Texas by decade. This figure only includes reservoirs with capacities of 5,000 acre-feet or more.

1984 discussed water conservation and reuse but did not recommend them as ways to meet future water needs. In the 1997 State Water Plan, however, water supply strategies involving conservation totaled 2.6 million acre-feet in the year 2050. In the 2002 State Water Plan, water demands and needs were reduced by about 2.0 million acre-feet in 2050 by combining water conservation strategies and savings from more efficient plumbing fixtures.[3] In the 2007 State Water Plan, recommended water conservation strategies and increases in water use efficiency reduce water demands and needs by 2.6 million acre-feet in the year 2050. Additional information on water conservation strategies in the 2007 State Water Plan is found in Section 10.2.1.

Desalination is another example of a promising new approach to water supply. Today, "desal" is recommended as a water management strategy in several areas of the state and is undergoing extensive study by TWDB. Governor Rick Perry and members of the Texas Legislature recently directed TWDB to encourage seawater desalination along the Gulf Coast and to facilitate cost-effective desalination technology in areas of the state with abundant brackish groundwater.

[3] Texas will save substantial amounts of water through what is known as "passive water conservation." Passive conservation involves water savings resulting from state and federal legislation requiring plumbing manufacturers to sell more water-efficient plumbing fixtures, such as showerheads, faucets, and toilets. Legislation includes the State Water Saving Performance Standards for Plumbing Fixtures Act of 1991 and the Federal Energy and Policy Conservation Act of 1992.

Aside from a changing focus on the types of projects and strategies, the overall approach to state water planning began to undergo changes in the 1990s. Beginning in 1992, TWDB started to broaden participation in the planning process by including stakeholders and other state agencies, such as the Texas Parks and Wildlife Department and the Texas Commission on Environmental Quality. The motivation for broadening participation was to increase transparency and efficiency in the planning process and solicit knowledge from a wider range of interests.

While this was an important step, it was small compared to changes that emerged toward the end of the decade. The same circumstances that led to the creation of TWDB and state water planning also served as the impetus for one of the most significant changes in how Texas conducts water planning. In 1996, Texas suffered an intense drought that caused sizeable economic losses and water shortages. Farmers suffered widespread crop failure, and reservoir levels dropped sharply throughout the state. Some cities—especially in South Texas—had to ration water for several months. Fortunately, this drought was relatively short, but it lasted long enough to remind Texans of the importance of water planning, and it highlighted the need for more local and regional involvement in water planning.

The drought of 1996 led to the passage of Senate Bill 1 in 1997. The law, enacted by the 75th Texas Legislature, established a new water planning process that relies primarily upon regional water plans prepared and adopted by local and regional

decision makers. In essence, the planning process shifted from a "top-down," centralized approach to a "bottom-up," consensus-driven model. Teams of regional and local leaders of different backgrounds and various social, environmental, and economic interests, with technical assistance from TWDB and other state agencies, provide a thorough regional assessment that can be merged into a comprehensive state water plan.

The first state water plan adopted after Senate Bill 1, *Water for Texas—2002*, incorporated the wealth of information and long-range vision contained within 16 individual regional water plans prepared and adopted by planning groups throughout Texas. Each planning group represents a geographic region in Texas with boundaries based on hydrologic and political borders.

The 2007 State Water Plan mirrors its 2002 predecessor in many ways but especially in one important feature—in its actualization of the vision of Senate Bill 1 that the state water plan embody and reflect an open and participatory process with specific decisions made at the regional level. The Senate Bill 1 planning process has continued to evolve in the second cycle by planning for a more discrete level of water providers, considering water conservation strategies to meet all needs identified in the regional water plans, evaluating the impacts to agriculture and natural resources, and involving more citizens. This is evidenced by the planning groups recommending significantly greater amounts of water conservation and reuse and considering the estimated impacts of water management strategies. In addition, the citizens of Texas have become more involved in and knowledgeable about planning for and providing adequate water supplies.

Today, TWDB continues to serve as the lead agency for adopting a state water plan. State law requiring a comprehensive update of the state water plan every five years recognizes the dynamic nature of water resource planning in Texas. TWDB, in partnership with the planning groups and other natural resource agencies of the state and federal government, will continue to lead this process in the future to help ensure that all Texans have an abundance of freshwater for our homes, businesses, farms, and the environment.

Table 3.1. Comparison of state water plan population projections and actual year 2000 census population data

Water plan	Baseline data for projection (U.S. Census)	Projected year 2000 population (millions)	Reported year 2000 population from U.S. Census (millions)	Margin of error (percent)
1968	1960	21.20	20.85	1.7
1984 ("high")[a]	1980	21.24	20.85	1.9
1984 ("low")[a]	1980	19.57	20.85	-6.1
1990	1980	20.99	20.85	0.7
1997	1990	20.30	20.85	-2.6
2002	1990	20.86	20.85	0.1

[a] The 1984 State Water Plan showed a range of projections ("high" and "low").

Table 3.2. Comparison of state water plan water demand projections and year 2000 TWDB Water Use Survey estimates

Water plan	Baseline data for projection (U.S. Census)	Projected year 2000 water demand (millions of acre-feet)	Year 2000 water use (millions of acre-feet)	Margin of error (percent)
1968[a]	1960	na	na	na
1984 ("high")	1980	25.43	16.98	49.8
1984 ("low")	1980	17.33	16.98	2.1
1990	1980	14.63	16.98	-13.8
1997	1990	16.59	16.98	-2.3
2002	1990	16.92	16.98	-0.4

Note: Year 2000 water use data are from TWDB's annual statewide Water Use Survey.
[a] Water demand estimates and projections in the 1968 plan are categorized differently from all other plans and are not comparable to current estimates.
"na" = not applicable

3.3 Historical Accuracy of Water Planning Projections

The current model for state and regional water planning is based on a classic decision-making paradigm. At a fundamental level, it involves (1) forecasting future conditions, including population, water demand, and water supplies; (2) describing and assessing regional conditions, including existing water supplies and water demand; (3) identifying and comparing alternative water management strategies to address future deficits; and (4) recommending water management strategies for implementation. Forecasting future conditions, although essential, is the most uncertain of these tasks because any projection can be significantly off the mark. Fortunately, TWDB has been estimating future population and water demands for about 50 years and has established a track record for accuracy (Tables 3.1 and 3.2).

Using 1960 census data, the 1968 State Water Plan projected that 21.20 million people would be living in Texas in the year 2000. Actual census figures showed that 20.85 million people were here in 2000. Thus, the margin of error for the 1968 forecast was only 1.7 percent. Projections from the 1984 State Water Plan estimated that population in the year 2000 would range from 19.57 to 21.24 million people, which again is very close to the actual number. The 1990 plan, also based on 1980 census data, forecasted year 2000 population at 20.99 million, only 0.7 percent greater than the actual number. TWDB adopted the 2002 State Water Plan when 1990 census figures were

the most recent data available. Thus, even though the plan was adopted in 2002, the forecasts used in the plan were 10-year projections. These forecasts were the most accurate population projections of all the state water plans, with an estimate that was only 0.1 percent larger than 2000 census figures.

Water demand projections have become more accurate with each water plan. The 1984 plan showed a range of possible future demands ("high" and "low"). Projected "low" water demand for 2000 was slightly higher than actual recorded use by a factor of only 2.1 percent. However, the "high" series was substantially larger with a margin of error of approximately 50 percent. Although the 1984 "high" series appears to be an anomaly, the planners intended this figure to reflect the maximum possible demand for water that could only be realized under unusual circumstances, such as intensive irrigation of all farms where irrigation is practical. After the 1984 projection, economic trends, urbanization, and political forces caused actual water use to fall well below the 1984 "high" estimate. In response, planners adjusted 1990 plan projections. However, 1990 figures were still off the mark by a negative 13.8 percent. In contrast, the 1997 plan projections were only 2.3 percent less than actual water use, and 2002 projections were only 0.4 percent lower than actual water use.

3.4 Implementation Status of 2002 State Water Plan

Although TWDB does not have a formal mechanism in place to track implementation of water management strategies recommended in past plans, the agency has undertaken efforts to assess the implementation progress of strategies from the 2002 State Water Plan. Given the large number of strategies involved, TWDB focused on those identified to meet municipal water needs in the year 2020. Based on the 2002 State Water Plan, cities and water utilities included in the municipal water use category with needs of at least 1,000 acre-feet per year were selected. In 2004, and again in 2006, TWDB contacted as many of these entities as possible to evaluate implementation progress. Since water projects, particularly those that involve infrastructure, can require several years or more to put into place, progress was defined as any type of project construction or any form of pre-implementation activity, such as negotiating contracts, applying for and securing financing and/or state and federal permits, or conducting preliminary engineering studies. Of the 238 entities contacted, the majority of them (149 or 63 percent) reported some form of progress on strategy implementation. Of these, 21 (9 percent) reported that strategies were operational, and 12 (5 percent) reported that project construction had begun.

References

Gleick, P., 2000, Biennial report on freshwater resources, 1998–1999: Washington, D.C., Island Press, 319 p.