Quick Facts

Municipal conservation strategies are expected to result in about 650,000 acre-feet of supply by 2060, with irrigation and other conservation strategies totaling another 1.5 million acre-feet per year.

The planning groups recommended 26 new major reservoirs projected to generate approximately 1.5 million acre-feet per year by 2060. Other surface water strategies would result in about 3 million acre-feet per year.

Recommended strategies relying on groundwater are projected to result in about 800,000 additional acre-feet per year by 2060.

7 Water Management Strategies

The regional planning groups recommended 562 unique water supply projects designed to meet needs for additional water supplies for Texas during drought, resulting in a total, if implemented, of 9.0 million acre-feet per year in additional water supplies by 2060. Some recommended strategies are associated with demand reduction or making supplies physically or legally available to users.

After identifying surpluses and needs for water in their regions, regional water planning groups evaluate and recommend water management strategies to meet the needs for water during a severe drought. Planning groups must address the needs of all water users, if feasible. If existing supplies do not meet future demand, they recommend specific water management strategies to meet water supply needs, such as conservation of existing water supplies, new surface water and groundwater development, conveyance facilities to move available or newly developed water supplies to areas of need, water reuse, and others.

TWDB may provide financial assistance for water supply projects only if the needs to be addressed by the project will be addressed in a manner that is consistent with the regional water plans and the state water plan. This same provision applies to the granting of water right permits by the Texas Commission on Environmental Quality, although the governing bodies of these agencies may grant a waiver to the consistency requirement. TWDB funding programs that are targeted at the implementation of state water plan projects, such as the Water Infrastructure Fund, further require that projects must be recommended water management strategies in the regional water plans and the state water plan to be eligible for financial assistance.

TABLE 7.1. RECOMMENDED WATER MANAGEMENT STRATEGY SUPPLY VOLUMES BY REGION (ACRE-FEET PER YEAR)

Region	2010	2020	2030	2040	2050	2060
A	2,718	332,468	545,207	617,843	631,629	648,221
B	15,373	40,312	40,289	49,294	76,252	77,003
C	79,898	674,664	1,131,057	1,303,003	2,045,260	2,360,302
D	11,330	16,160	20,180	33,977	62,092	98,466
E	3,376	66,225	79,866	98,816	112,382	130,526
F	90,944	157,243	218,705	236,087	235,400	235,198
G	137,858	405,581	436,895	496,528	562,803	587,084
H	378,759	622,426	863,980	1,040,504	1,202,010	1,501,180
I	53,418	363,106	399,517	427,199	607,272	638,076
J	13,713	16,501	20,360	20,862	20,888	23,010
K	350,583	576,795	554,504	571,085	565,296	646,167
L	188,297	376,003	542,606	571,553	631,476	765,738
M	90,934	182,911	275,692	389,319	526,225	673,846
N	46,954	81,020	130,539	130,017	133,430	156,326
O	517,459	503,886	504,643	464,588	429,136	395,957
P	67,739	67,739	67,739	67,740	67,739	67,739
Total	**2,049,353**	**4,483,040**	**5,831,779**	**6,518,415**	**7,909,290**	**9,004,839**

7.1 EVALUATION AND SELECTION OF WATER MANAGEMENT STRATEGIES

After the water demand and supply comparisons and needs analyses were completed, planning groups evaluated potentially feasible water management strategies to meet the needs for water within their regions. A water management strategy is a plan or a specific project to meet a need for additional water by a discrete user group, which can mean increasing the total water supply or maximizing an existing supply. Strategies can include development of new groundwater or surface water supplies; conservation; reuse; demand management; expansion of the use of existing supplies such as improved operations or conveying water from one location to another; or less conventional methods like weather modification, brush control, and desalination.

Factors used in the water management strategy assessment process include

- the quantity of water the strategy could produce;
- capital and annual costs;
- potential impacts the strategy could have on the state's water quality, water supply, and agricultural and natural resources (Chapter 8, Impacts of Plans); and
- reliability of the strategy during time of drought.

Calculating the costs of water management strategies is done using uniform procedures to compare costs between regions and over time, since some strategies are recommended for immediate implementation, while others are needed decades into the future. Cost assumptions include expressing costs in 2008 dollars, using a 20-year debt service schedule, using capital costs of construction as well as annual operation and maintenance costs, and providing unit costs per acre-foot of water produced.

Reliability is an evaluation of the continued availability of an amount of water to the users over time, but particularly during drought. A water management strategy's reliability is considered high if water is determined to be available to the user all the time, but

TABLE 7.2. RECOMMENDED WATER MANAGEMENT STRATEGY SUPPLY VOLUMES BY TYPE OF STRATEGY (ACRE-FEET PER YEAR)

Type of Water Management Strategy	2010	2020	2030	2040	2050	2060
Municipal Conservation	137,847	264,885	353,620	436,632	538,997	647,361
Irrigation Conservation	624,151	1,125,494	1,351,175	1,415,814	1,463,846	1,505,465
Other Conservation *	4,660	9,242	15,977	18,469	21,371	23,432
New Major Reservoir	19,672	432,291	918,391	948,355	1,230,573	1,499,671
Other Surface Water	742,447	1,510,997	1,815,624	2,031,532	2,700,690	3,050,049
Groundwater	254,057	443,614	599,151	668,690	738,484	800,795
Reuse	100,592	428,263	487,795	637,089	766,402	915,589
Groundwater Desalination	56,553	81,156	103,435	133,278	163,083	181,568
Conjunctive Use	26,505	88,001	87,496	113,035	136,351	135,846
Aquifer Storage and Recovery	22,181	61,743	61,743	72,243	72,243	80,869
Weather Modification	0	15,206	15,206	15,206	15,206	15,206
Drought Management	41,701	461	461	461	461	1,912
Brush Control	18,862	18,862	18,862	18,862	18,862	18,862
Seawater Desalination	125	125	143	6,049	40,021	125,514
Surface Water Desalination	0	2,700	2,700	2,700	2,700	2,700
Total Supply Volumes	**2,049,353**	**4,483,040**	**5,831,779**	**6,518,415**	**7,909,290**	**9,004,839**

*Other conservation is associated with manufacturing, mining, and steam-electric power industries.

it is considered low or moderate if the availability is contingent on other factors.

The water management strategy evaluation process also considered other factors applicable to individual regions including difficulty of implementation, regulatory issues, regional or local political issues, impacts to recreation, and socioeconomic benefits or impacts.

Upon conclusion of a thorough evaluation process, planning groups recommended a combination of water management strategies to meet specific needs in their regions during a repeat of the drought of record. In this planning cycle, planning groups could also include alternative water management strategies in their plans. An alternative strategy may be substituted for a strategy that is no longer recommended, under certain conditions and with the approval of the TWDB executive administrator. All recommended and alternative water management strategies included in the 2011 regional water plans are presented in Appendix A.

7.2 SUMMARY OF RECOMMENDED WATER MANAGEMENT STRATEGIES

To meet the needs for water during a repeat of the drought of record, regional water planning groups evaluated and recommended water management strategies that would account for an additional 9.0 million acre-feet per year of water by 2060 if all are implemented (Tables 7.1 and 7.2). These strategies included 562 unique water supply projects designed to meet needs for additional water supplies for Texas during drought (this figure is lower than presented in previous plans because it does not separately count each entity participating in a given project).

7.2.1 WATER CONSERVATION

Conservation focuses on efficiency of use and the reduction of demands on existing water supplies. In 2010, almost 767,000 acre-feet per year of water conservation savings is recommended, increasing to nearly 2.2 million acre-feet per year by 2060 from all forms of conservation strategies (Table 7.3). Some of the savings from water conservation practices are achieved

TABLE 7.3. SUPPLY VOLUMES FROM RECOMMENDED CONSERVATION STRATEGIES BY REGION (ACRE-FEET PER YEAR)

Region	2010	2020	2030	2040	2050	2060
A	0	299,077	488,721	544,840	553,661	556,914
B	13,231	13,798	13,833	13,875	13,891	14,702
C	46,780	107,975	154,950	197,288	240,912	290,709
D	0	0	0	0	0	0
E	0	33,275	37,275	41,275	46,275	52,275
F	3,197	43,113	80,551	81,141	81,769	82,423
G	10,857	24,873	31,473	33,757	38,011	41,758
H	116,880	137,151	147,529	156,336	172,831	183,933
I	20,111	30,480	33,811	36,085	41,381	41,701
J	579	622	641	643	669	681
K	18,498	169,207	179,630	192,541	221,622	241,544
L	33,843	41,032	47,818	53,944	64,761	82,297
M	15,743	54,469	102,047	154,932	217,882	286,629
N	1,664	2,449	3,398	4,466	5,766	7,150
O	485,275	442,100	399,095	359,792	324,783	293,542
P	0	0	0	0	0	0
Total	**766,658**	**1,399,621**	**1,720,772**	**1,870,915**	**2,024,214**	**2,176,258**

passively in the normal course of daily activities, such as flushing a low-flow toilet or showering with a low-flow showerhead. Other savings are achieved through education and programs designed specifically to reduce water usage. Conservation includes water savings from municipal, irrigation, and "other" (mining, manufacturing, and power generation) water users. Water conservation is being recommended in greater quantities over time. Comparing the 2007 State Water Plan with the 2012 plan, there is an additional 129,400 acre-feet of water conservation recommended in the current plan.

7.2.2 SURFACE WATER STRATEGIES

Surface water strategies include stream diversions, new reservoirs, other surface water strategies such as new or expanded contracts or connection of developed supplies, and operational changes.

One long-term trend in Texas is the relative shift from reliance on groundwater to surface water. The volume of water produced by surface water strategies recommended in 2060 is five times greater than that produced by recommended groundwater strategies. Surface water strategies, excluding desalination and non-traditional strategies, compose about 51 percent of the recommended volume of new water, compared to 9 percent from groundwater strategies in the 2012 State Water Plan. Surface water management strategies recommended by the regional planning groups total in excess of 4.5 million acre-feet per year by 2060.

In the 2012 State Water Plan, 26 new major reservoirs are recommended to meet water needs in several regions (Figure 7.1). A major reservoir is defined as one having 5,000 or more acre-feet of conservation storage. These new reservoirs would produce 1.5 million acre-feet per year in 2060 if all are built, representing 16.7 percent of the total volume of all recommended strategies for 2060 combined (Figure 7.2). Not surprisingly, the majority of these projects would be located east of the Interstate Highway-35 corridor where rainfall and resulting runoff are more plentiful than in the western portion of the state.

FIGURE 7.1. RECOMMENDED NEW MAJOR RESERVOIRS.

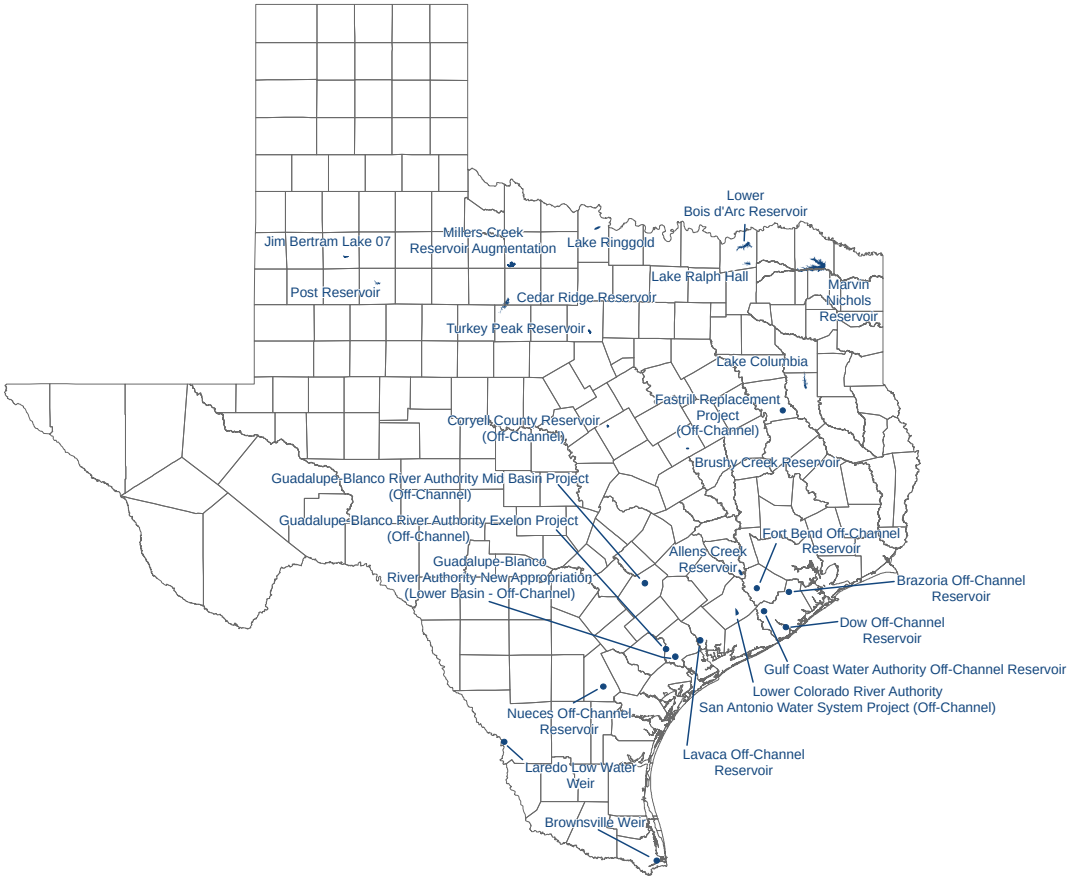


FIGURE 7.2. RELATIVE VOLUMES OF RECOMMENDED WATER MANAGEMENT STRATEGIES IN 2060.

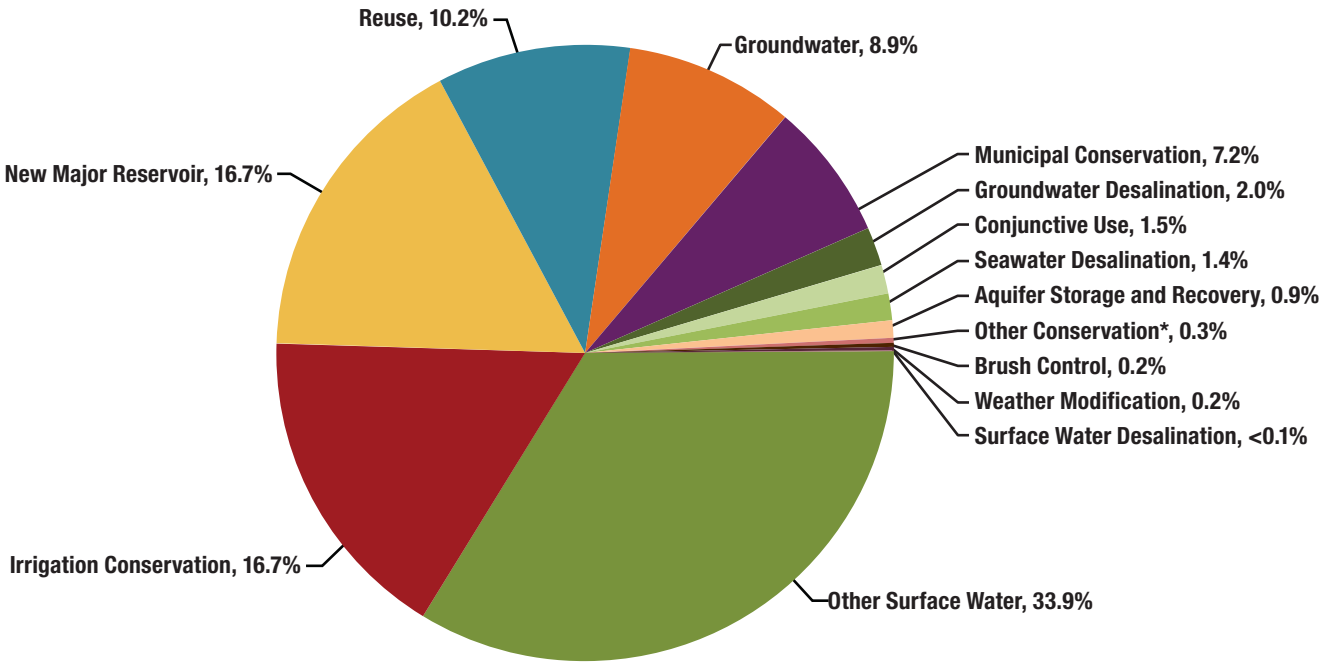
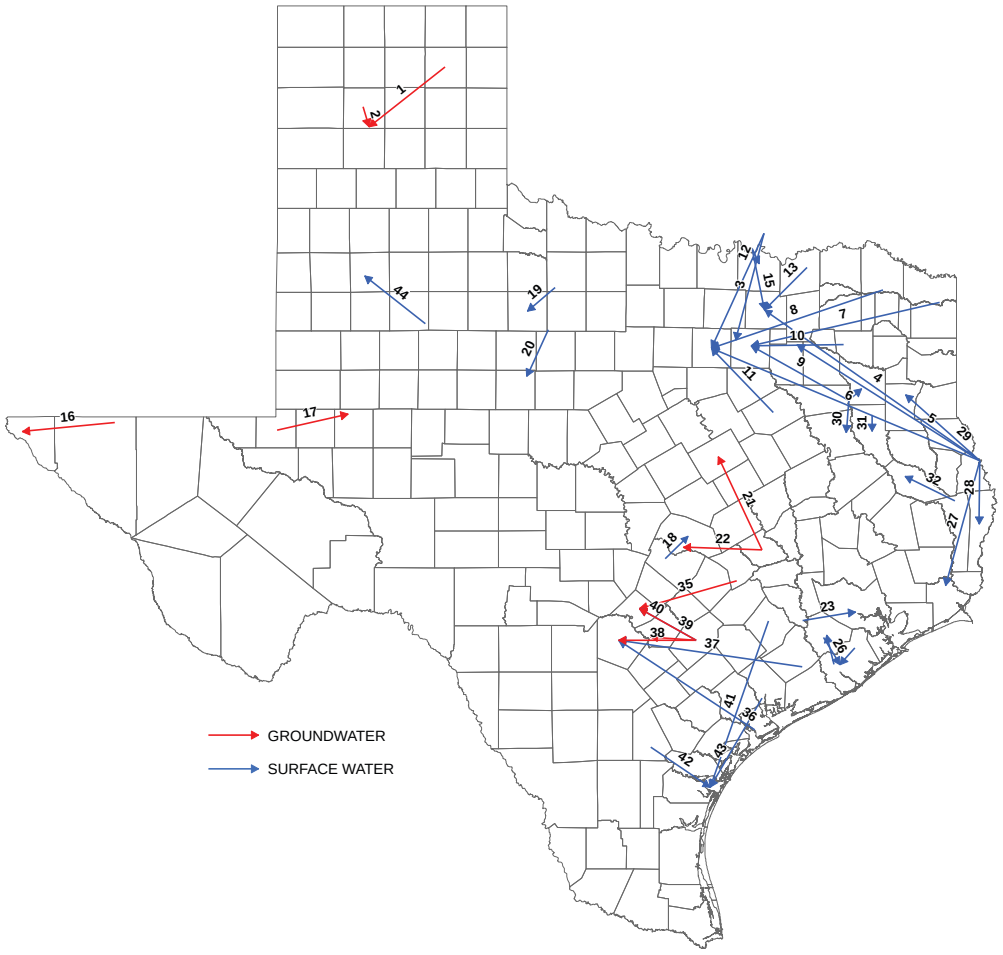


FIGURE 7.3. RECOMMENDED GROUND AND SURFACE WATER CONVEYANCE AND TRANSFER PROJECTS.



"Other surface water" strategies include existing supplies that are not physically or legally available at the present time. Examples include an existing reservoir that has no pipeline to convey water to some or all users, a water user that does not have a water supply contract with the appropriate water supplier, or an entity that has no "run-of-river" water right to divert water for use.

Other surface water strategies are recommended to provide in excess of 742,400 acre-feet per year of supply in 2010, and about 3 million acre-feet per year by 2060. Other surface water is the largest water management strategy category recommended, and usually requires additional infrastructure such as new pipelines to divert and convey water from an existing source to a new point of use. Transporting water from existing, developed sources such as reservoirs, to a new point of use many miles away, is very common in Texas and will become more prevalent in the future. An example is the current project to construct a joint pipeline from Lake Palestine to transport water to Dallas and water from Tarrant Regional Water District's lakes to Fort Worth. Figure 7.3 and Table 7.4 depict recommended major groundwater and surface water conveyance and transfer projects.

TABLE 7.4. RECOMMENDED GROUND AND SURFACE WATER CONVEYANCE AND TRANSFER PROJECTS

ID	Project	Conveyance From	To
1	Roberts County Well Field	Roberts County	Amarillo
2	Potter County Well Field	Potter County	Amarillo
3	Oklahoma Water to Irving	Oklahoma Lake/Reservoir	Irving
4	Toledo Bend Project	Toledo Bend Reservoir	Collin County
5	Toledo Bend Project	Toledo Bend Reservoir	Kaufman County
6	Toledo Bend Project	Toledo Bend Reservoir	Tarrant County
7	Wright Patman - Reallocation of Flood Pool	Wright Patman Lake	Dallas
8	Marvin Nichols Reservoir	Marvin Nichols Reservoir	Colin, Denton, Tarrant Counties
9	Lake Palestine Connection (Integrated Pipeline with Tarrant Regional Water District)	Lake Palestine	Dallas
10	Additional Pipeline From Lake Tawakoni (More Lake Fork Supply)	Lake Fork	Dallas
11	Tarrant Regional Water District Third Pipeline and Reuse	Navarro County	Tarrant County
12	Oklahoma Water to North Texas Municipal Water District, Tarrant Regional Water District, Upper Trinity Regional Water District	Oklahoma Lake/Reservoir	Colin, Denton, Tarrant Counties
13	Lower Bois D'Arc Creek Reservoir	Lower Bois D'Arc Reservoir	Collin County
14	Grayson County Project	Lake Texoma Non-System Portion	Collin, Grayson Counties
15	Lake Texoma - Authorized (Blend)	Lake Texoma North Texas Municipal Water District System	Collin County
16	Integrated Water Management Strategy - Import From Dell Valley	Dell City	El Paso
17	Develop Cenozoic Aquifer Supplies	Winkler County	Midland
18	Regional Surface Water Supply	Lake Travis	Williamson County
19	Millers Creek Augmentation	Millers Creek Reservoir	Haskell County
20	Cedar Ridge Reservoir	Cedar Ridge Reservoir	Abilene
21	Conjunctive Use (Lake Granger Augmentation)	Burleson County	Mclennan
22	Conjunctive Use (Lake Granger Augmentation)	Burleson County	Round Rock
23	Allens Creek Reservoir	Allens Creek Lake/Reservoir	Houston
24	Gulf Coast Water Authority Off-Channel Reservoir	Gulf Coast Water Authority Off-Channel Reservoir	Fort Bend County
25	Brazoria Off-Channel Reservoir	Brazoria Off-Channel Reservoir	Brazoria County
26	Fort Bend Off-Channel Reservoir	Fort Bend Off-Channel Lake/Reservoir	Brazoria County
27	Purchased Water	Toledo Bend Reservoir	Jefferson County
28	Purchased Water	Toledo Bend Reservoir	Newton County
29	Purchased Water	Toledo Bend Reservoir	Rusk County
30	Purchased Water	Lake Palestine	Anderson County
31	Lake Columbia	Lake Columbia	Cherokee County
32	Angelina County Regional Project	Sam Rayburn-Steinhagen Reservoir System	Lufkin
33	Lake Palestine Infrastructure	Lake Palestine	Tyler
34	Regional Carrizo For Schertz-Seguin Local Government Corporation Project Expansion	Gonzales County	Guadalupe County
35	Guadalupe-Blanco River Authority Simsboro Project	Lee County	Comal County
36	Seawater Desalination	Gulf Of Mexico Sea Water	Bexar County
37	Off-Channel Reservoir - Lower Colorado River Authority/ San Antonio Water System Project (Region L Component)	Colorado, Matagorda, Wharton Counties	Bexar County
38	Regional Carrizo For Saws (Including Gonzales County)	Gonzales County	Bexar County
39	Guadalupe-Blanco River Authority Mid-Basin (Surface Water)	Gonzales County	Comal County
40	Texas Water Alliance Regional Carrizo (Including Gonzales County)	Carrizo-Wilcox Aquifer	Comal County
41	Garwood Pipeline And Off-Channel Reservoir Storage	Colorado River	Corpus Christi
42	Off-Channel Reservoir Near Lake Corpus Christi	Nueces Off-Channel Reservoir	Corpus Christi
43	Lavaca River Off-Channel Reservoir Diversion Project	Lavaca Off-Channel Reservoir	Corpus Christi
44	Lake Alan Henry Pipeline	Lake Alan Henry	Lubbock

Some regions recommended operational improvement strategies for existing reservoirs to increase their efficiency by working in tandem with one or more other reservoirs as a system. "System operations" involves operating multiple reservoirs as a system to gain the maximum amount of water supply from them.

Reallocation of reservoir storage from one approved purpose to another is a strategy that was recommended by some regions to meet needs from existing reservoirs. This reallocation requires formal changes in the way reservoirs are operated and shifts more of the storage space from flood control or hydro-electric power generation to water supply. If the operational change involves a federal agency such as the U.S. Army Corps of Engineers, congressional approval is required if the reallocation involves more than 50,000 acre-feet. These operational changes may come at a cost, however. Compensation for lost electrical generation will likely be required for hydro-electric storage reallocation, and additional property damages from flooding are possible if flood storage capacity is reduced.

7.2.3 GROUNDWATER STRATEGIES

Groundwater management strategies recommended in the regional water plans total 254,057 acre-feet in 2010 and increasing to 800,795 acre-feet in 2060. Additional recommendations for groundwater desalination of 56,553 acre-feet in 2010 and 181,568 acre-feet in 2060 result in a total of 310,610 acre-feet of groundwater in 2010 and 982,363 acre-feet in 2060. Desalination of brackish groundwater and other groundwater management strategies compose about 11 percent of the total volume of water from recommended strategies in 2060. Not including desalination, the recommended groundwater strategies involve some combination of the following: 1) installing new wells; 2) increasing production from existing wells; 3) installing supplemental wells; 4) temporarily over-drafting aquifers to supplement supplies; 5) building, expanding, or replacing treatment plants to make groundwater meet water quality standards; and 6) reallocating or transferring groundwater supplies from areas where projections indicate that surplus groundwater will exist to areas with needs.

7.2.4 WATER REUSE STRATEGIES

Water management strategies involving reuse are recommended to provide roughly 100,600 acre-feet per year of water in 2010, increasing to approximately 915,600 acre-feet per year in 2060. This represents slightly more than 10 percent of the volume of water produced by all strategies in 2060. Reuse projects in the 2012 State Water Plan produce approximately 348,000 acre-feet less water than those recommended in 2007. This is directly related to several recommended wastewater effluent reuse projects that were funded through TWDB's Water Infrastructure Fund and have been implemented in the intervening five-year period.

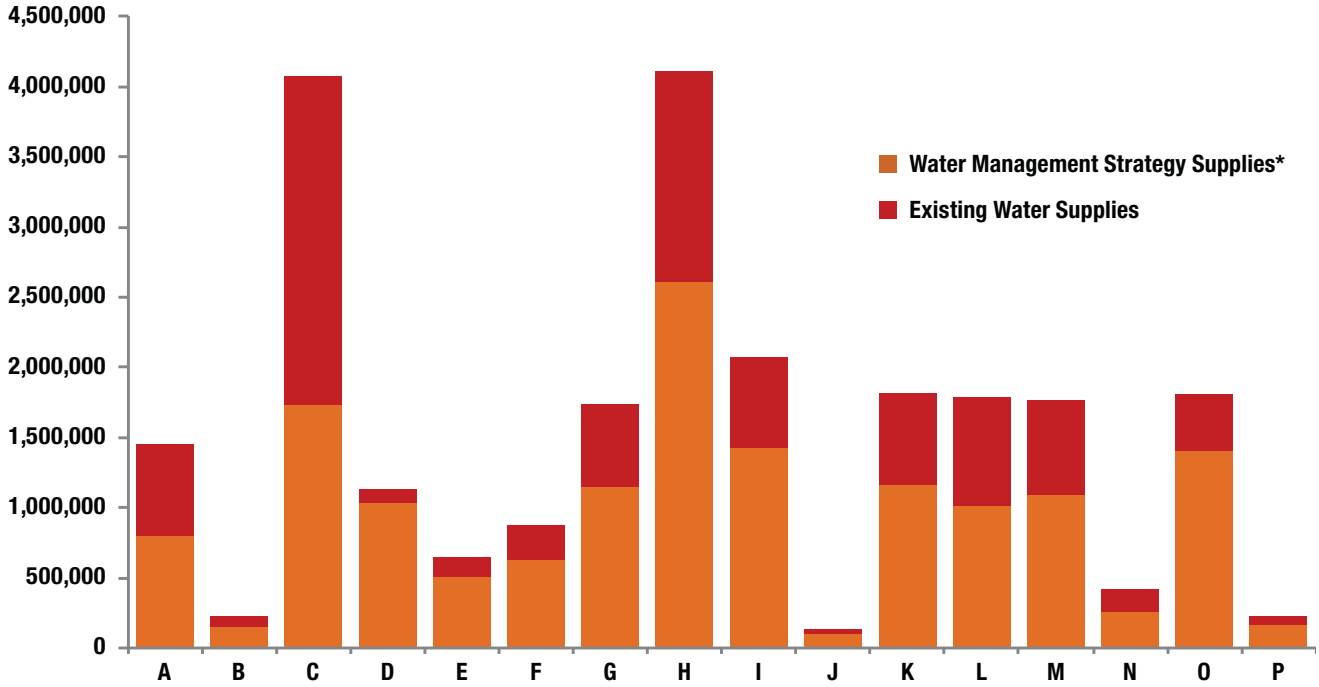
Direct reuse projects in which the wastewater never leaves the treatment system until it is conveyed through a pipeline to the point of use do not require an additional conveyance permit. These projects are commonly used to provide water for landscapes, parks, and other irrigation in many Texas communities.

Indirect reuse involves discharge of wastewater into a stream and later routing or diverting it for treatment as water supply. Since the wastewater is discharged into state water for conveyance downstream, it requires authorization known as a "bed and banks permit" from the Texas Commission on Environmental Quality.

TABLE 7.5. RECOMMENDED WATER MANAGEMENT STRATEGY CAPITAL COSTS BY REGION (MILLIONS OF DOLLARS)

Region	2010	2020	2030	2040	2050	2060	Total
A	$187	$129	$137	$287	—	—	$739
B	$110	—	—	$7	$383	—	$499
C	$9,922	$3,976	$3,891	$928	$17	$2,747	$21,482
D	$39	—	—	—	—	—	$39
E	—	$382	—	$246	$214	—	$842
F	$223	$439	$252	—	—	—	$915
G	$2,064	$745	$94	$273	$10	—	$3,186
H	$4,710	$4,922	$287	$1,135	$458	$506	$12,019
I	$363	$350	$79	$80	—	$12	$885
J	$11	$44	—	—	—	—	$55
K	$663	$67	$4	$169	—	$4	$907
L	$1,022	$2,973	$2,321	$2	$12	$1,294	$7,623
M	$2,070	$124	—	—	—	—	$2,195
N	$45	$113	$360	—	—	$139	$656
O	$669	$273	$167	—	—	—	$1,108
P	—	—	—	—	—	—	—
Total	**$22,097**	**$14,537**	**$7,592**	**$3,127**	**$1,095**	**$4,702**	**$53,150**

FIGURE 7.4. EXISTING SUPPLIES AND RECOMMENDED WATER MANAGEMENT STRATEGY SUPPLIES BY REGION (ACRE-FEET PER YEAR).



* Some water management strategies include demand reduction or shifts of existing supplies to other users.

Using artificially created wetlands to provide biological treatment such as nutrient uptake, the Tarrant Regional Water District was the first wholesale water provider in Texas to discharge treated wastewater through a natural filtering system before returning the water to its water supply lakes. This provides an additional source of water, which then can be diverted to water treatment plants for potable use. Similar indirect reuse projects are being implemented by other water suppliers in north Texas, and additional projects are in the planning stages.

7.2.5 OTHER STRATEGIES

Conjunctive use is the combined use of multiple sources that optimizes the beneficial characteristics of each source. Approximately 136,000 acre-feet of water per year is recommended by 2060 from this strategy.

Weather modification, sometimes referred to as cloud seeding, is the application of scientific technology that can enhance a cloud's ability to produce precipitation. More than 15,000 acre-feet per year of new supply is recommended from this strategy for all decades between 2020 and 2060 in Region A.

Drought management is a temporary demand reduction technique based on groundwater or surface water supply levels of a particular utility. Unlike conservation, which can be practiced most or all of the time, drought management is temporary and is usually associated with summer weather conditions. Drought management is recommended to supply nearly 2,000 acre-feet per year by 2060.

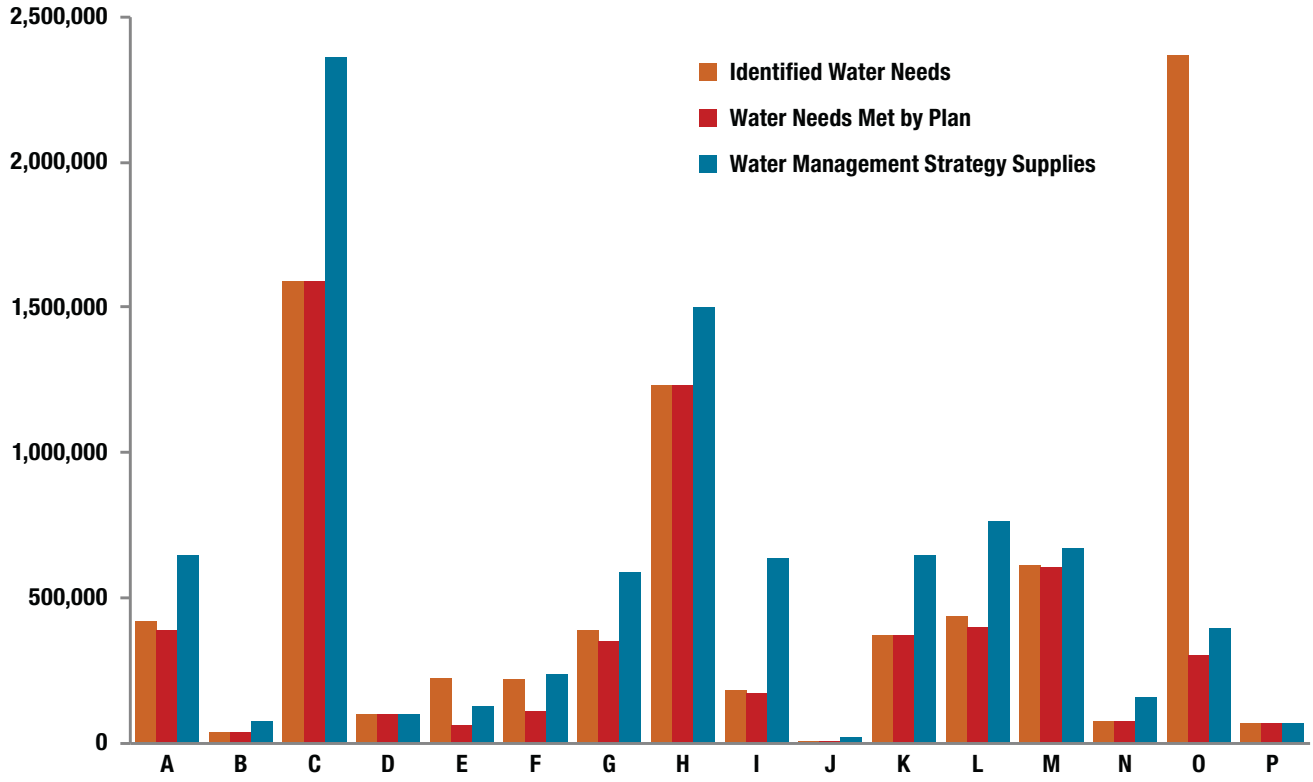
Aquifer storage and recovery refers to the practice of injecting potable water into an aquifer where it is stored for later use, often to meet summer peak usage demands. This strategy is feasible only in certain formations and in areas where only the utility owning the water can access it. It is recommended to provide almost 81,000 acre-feet per year by 2060.

Brush control and other land stewardship techniques have been recommended for many areas in the western half of the state. Removing ash juniper and other water consuming species has been shown in studies to restore springflow and improve surface water runoff in some cases. However, since water produced by this strategy during a drought when little rainfall occurs is difficult to quantify, it is not often recommended as a strategy to meet municipal needs. Brush control is recommended to supply approximately 19,000 acre-feet per year in all decades between 2010 and 2060.

Desalination, the process of removing salt from seawater or brackish water, is expected to produce nearly 310,000 acre-feet of potable water by 2060. Improvements in membrane technology, new variations on evaporative-condensation techniques, and other more recent changes have made desalination more cost-competitive than before. However, it is a very energy-intensive process and power costs have a significant effect on the price of produced water.

Rainwater harvesting is the capture, diversion, and storage of rainwater for landscape irrigation, drinking and domestic use, aquifer recharge, and stormwater abatement. Rainwater harvesting helps reduce outdoor irrigation demands on potable water systems. While it is often a component of municipal water conservation programs, rainwater harvesting was not recommended as a water management strategy to meet needs since, like brush control, the volume of water may not be available during drought conditions.

FIGURE 7.5. WATER NEEDS, NEEDS MET BY PLANS, AND STRATEGY SUPPLY BY REGION (ACRE-FEET PER YEAR).



DROUGHT MANAGEMENT

On April Fool's Day in 1911, legendary Texas cattleman and oil pioneer, W.T. "Tom" Waggoner, discovered oil on his family's ranch near Electra. In the midst of one of the worst droughts on record, he exclaimed, "Damn the oil, I need water for my cattle." (Time Magazine US, 2011).

Though his perspective may have changed with the expansion of the Waggoner ranching and oil empire, water has remained scarce in the region, particularly during times of drought. Nearly a century later, the town of Electra—named after Tom Waggoner's daughter—faced a desperate situation during the drought of 2000. With a mere 45-day water supply, the town imposed severe water restrictions. Residents were limited to 1,000 gallons of water per person per month, about a third of an average American's typical water use. All outdoor watering was banned and people were asked to use their toilets five times before flushing (CNN, 2000).

Drought management strategies, such as those used in Electra in 2000, are temporary measures that are used to reduce water demand during a drought. All wholesale and retail public water suppliers and irrigation districts in Texas must include these measures in drought contingency plans as required by the Texas Water Code. In Region B and many areas of Texas, water conservation and drought management are a way of life.

7.3 WATER MANAGEMENT STRATEGY TOTALS AND COSTS

As discussed further in Chapter 9 (Financing Needs), the total capital costs of the 2012 State Water Plan—representing all of the water management strategies recommended by the regional water planning groups—is $53 billion. The estimated capital costs of strategy implementation has increased significantly from the 2007 estimate of $31 billion, and it does not include annual costs such as operational and maintenance costs (Table 7.5). The increase in costs is attributable to several factors, including an increased volume of strategies in areas of high population growth, increased construction costs, increased costs of purchasing water rights, increased land and mitigation costs, and the addition of new projects to address uncertainty and other considerations.

In general, recommended water management strategy supply volumes increased significantly over the 50-year planning period due to the anticipated increase in population and water demands, coupled with a reduction of current supplies over time. In Figure 7.4, the total water supply volume from all recommended water management strategies for each region is shown in addition to the current water supplies. The total in this figure is not the total water available to the region because water management strategies include redistribution of existing supplies and water conservation, which are reductions in demands.

Some regions recommended water management strategies that would provide water in excess of their identified needs. This was done for various reasons including uncertainty in the ability of a strategy to be implemented; recommending the ultimate capacity of the strategy such as a reservoir in a decade before the entire firm yield is needed; potential acceleration of population and demand growth; and uncertainty related to demand and supply projections, due to various factors such as climate variability or the possibility of a drought worse than the drought of record (Figure 7.5).

REFERENCES

CNN, 2000, Texas Drought Order: Don't Flush, http://www.cnn.com/2000/WEATHER/08/01/drought.01/index.html.

Time Magazine US, 2011, Milestones December 23, 1934: Time Magazine, http://www.time.com/time/magazine/article/0,9171,711640,00.html#ixzz1LUcDQnR.