

## 4. Comparison of Current Water Supply and Projected Water Demand

This section describes the comparison of the current water supply for drought of record conditions (discussed in Section 3) and the projected water demand (discussed in Section 2). TWDB guidelines require that surpluses and needs for additional water supply be developed by decade for each water user group in the region based on this comparison. The specific surpluses and needs shown should be treated with caution because their development requires certain arbitrary assumptions:

- TWDB guidelines require that the comparison be based on currently connected supplies, without considering future connection of already developed supplies<sup>(1)</sup>.
- As discussed in Section 3 and Appendix J, the division of existing supplies among users is necessarily arbitrary. (For example, the total amount of groundwater available in a county must be divided among users in that county. The total supply available from a major water provider must be divided among its customers. These divisions could be made in many ways.)
- TWDB guidelines require the assumption that water purchased under a contract will become unavailable at the current expiration date of the contract. In many cases, both the seller and the purchaser plan to renew the contract, and the assumption that renewal will not occur results in misleading information.

The resulting comparison shows the surpluses and needs that will exist in Region C if no steps are taken to connect existing water supplies, develop additional water supplies or even to renew existing contracts when they expire. This is the comparison required by TWDB planning guidelines<sup>(1)</sup>. Development of infrastructure to make existing supplies available to users, development of new supplies, and renewal of existing contracts are treated as water management strategies to develop additional supplies, and they will be discussed in Section 5.

The remaining parts of this section present the comparison of current water supply and projected water demand in Region C. Section 4.1 gives a regional comparison of current supply and projected demand. Section 4.2 presents comparison of current supply and projected demand by water user group. Section 4.3 discusses the comparison of current supply and projected demand for the five major water providers in the region. Section 4.4 presents the economic impacts of not meeting the needs projected for Region C, and Section 4.5 is a summary of the comparison of supply and demand for Region C.

#### **4.1 Regional Comparison of Supply and Demand**

Table 4.1 and Figure 4.1 summarize the comparison of total currently connected water supply and total projected water demand in Region C. For the region as a whole, a surplus of 129,325 acre-feet per year in 2000 turns into a need for additional supply of 204,373 acre-feet per year by 2010. The need for additional supply for the region as a whole is projected to grow to 1,096,407 acre-feet per year by 2050 based on currently connected supplies. In 2000, Cooke, Dallas, and Parker Counties (3 out of 16 in the region) show a net need for more water when all uses are totaled. By 2050, 11 out 16 Region C counties (all except Fannin, Grayson, Henderson, Jack, and Navarro Counties) show a net need for more water over all uses. Out of 281 individual water user groups in Region C, 193 water user groups are predicted to have a need for additional water by 2050 for drought of record conditions.

The comparison of supply and demand in Table 4.1 and Figure 4.1 focuses on currently connected supplies. Region C also has significant unconnected supplies that could be made available to the region. An unconnected water supply is an existing and permitted supply that is not currently available due to infrastructure limitations. Table 4.2 lists some of the major unconnected water supplies that could be made available to Region C. Table 4.3 and Figure 4.2 show the comparison of total supply with demand for Region C, including connected and unconnected supply. By 2030, the projected demand for Region C exceeds total connected and unconnected supply.

#### **4.2 Comparison of Connected Supply and Demand by Water User Group**

Appendix L includes Texas Water Development Board Table 7, which shows the surplus or need for additional supplies by water user group, county, and basin for each decade in the planning period. Table 4.4 summarizes the projected surpluses and needs by county for each decade of the planning period. In general, the largest water needs are in Collin, Dallas, Denton and Tarrant Counties, with lesser but still significant needs in other counties.

Appendix L also includes a county-by-county discussion of the surpluses and needs shown in TWDB Table 7. Section 5 of this report will discuss the selection of water

**Table 4.1**  
**Comparison of Connected Supply with Projected Demand by Decade for Region C**

	Amount (Acre-Feet per Year)					
	2000	2010	2020	2030	2040	2050
Connected Supply	1,508,421	1,494,369	1,473,974	1,458,790	1,452,121	1,444,931
Projected Demand	1,376,373	1,695,661	1,944,893	2,149,826	2,368,188	2,536,902
Demands Exported from Region C <sup>a</sup>	2,723	3,081	3,129	3,585	3,985	4,436
Region-Wide Surplus or (Need)	129,325	(204,373)	(474,048)	(694,621)	(920,052)	(1,096,407)
Counties with Needs (Out of 16)	3	11	11	11	11	11
User Groups with Needs (Out of 281)	82	178	185	188	190	193

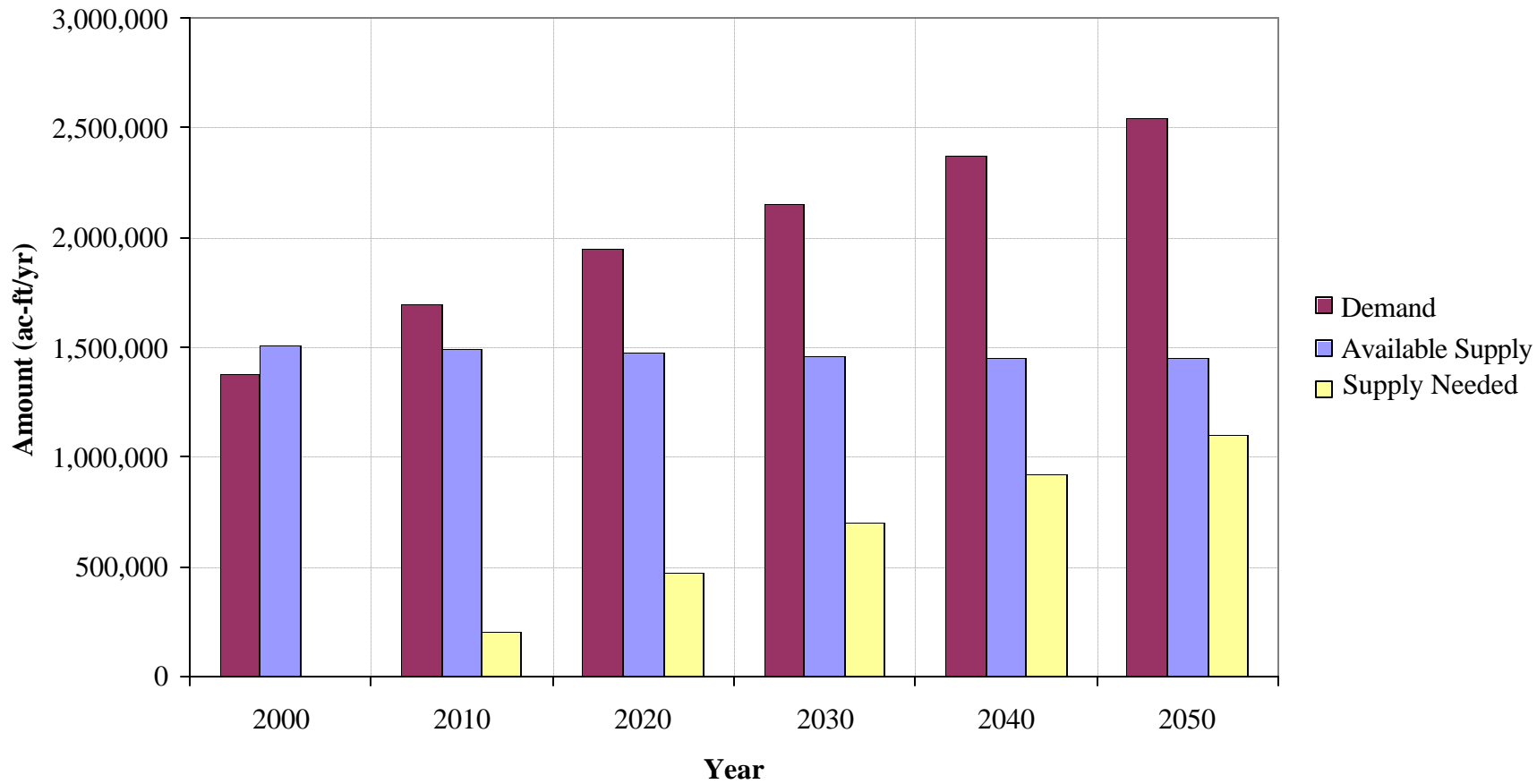
Note: a. Water is exported from Region C to Hill and Johnson Counties to supply Post Oak WSC, Burleson, and Mansfield.

**Table 4.2**  
**Major Unconnected Water Supplies for Region C**

Unconnected Source	Owner	Available Unconnected Supply in Acre-Feet per Year					
		2000	2010	2020	2030	2040	2050
Lake Fork Reservoir <sup>a</sup>	Dallas	120,000	120,000	120,000	120,000	120,000	120,000
Additional Cedar Creek/Richland-Chambers <sup>b</sup>	Tarrant RWD	117,608	118,630	118,163	117,770	117,633	115,227
Lake Palestine <sup>a</sup>	Dallas	112,700	112,100	111,500	110,900	110,200	109,600
Additional Freestone County Groundwater	-	89,407	89,407	89,406	89,405	89,404	89,403
Additional Lake Chapman	Irving and Upper Trinity RWD	65,700	65,200	64,800	64,300	63,800	59,700
Additional Lake Texoma	Denison and Greater Texoma UA	15,790	15,790	15,790	15,790	15,790	15,790
Corsicana's Richland-Chambers	Corsicana	13,650	13,650	13,650	13,650	13,650	13,650
Additional Navarro County Groundwater	-	11,338	11,338	11,338	11,035	11,035	11,035
Additional Joe Pool Lake	Trinity RA	11,558	10,623	9,830	9,264	8,995	8,753
Moss Lake	Gainesville	4,500	4,500	4,500	4,500	4,500	4,500

Notes: a. Values for Lake Fork Reservoir and Lake Palestine represent Dallas' share of the yield.  
b. Additional Cedar Creek/Richland Chambers represents the additional supply that could be made available by expanding transmission facilities.

**Figure 4.1**  
**Comparison of Connected Supply and Projected Demand for Region C**



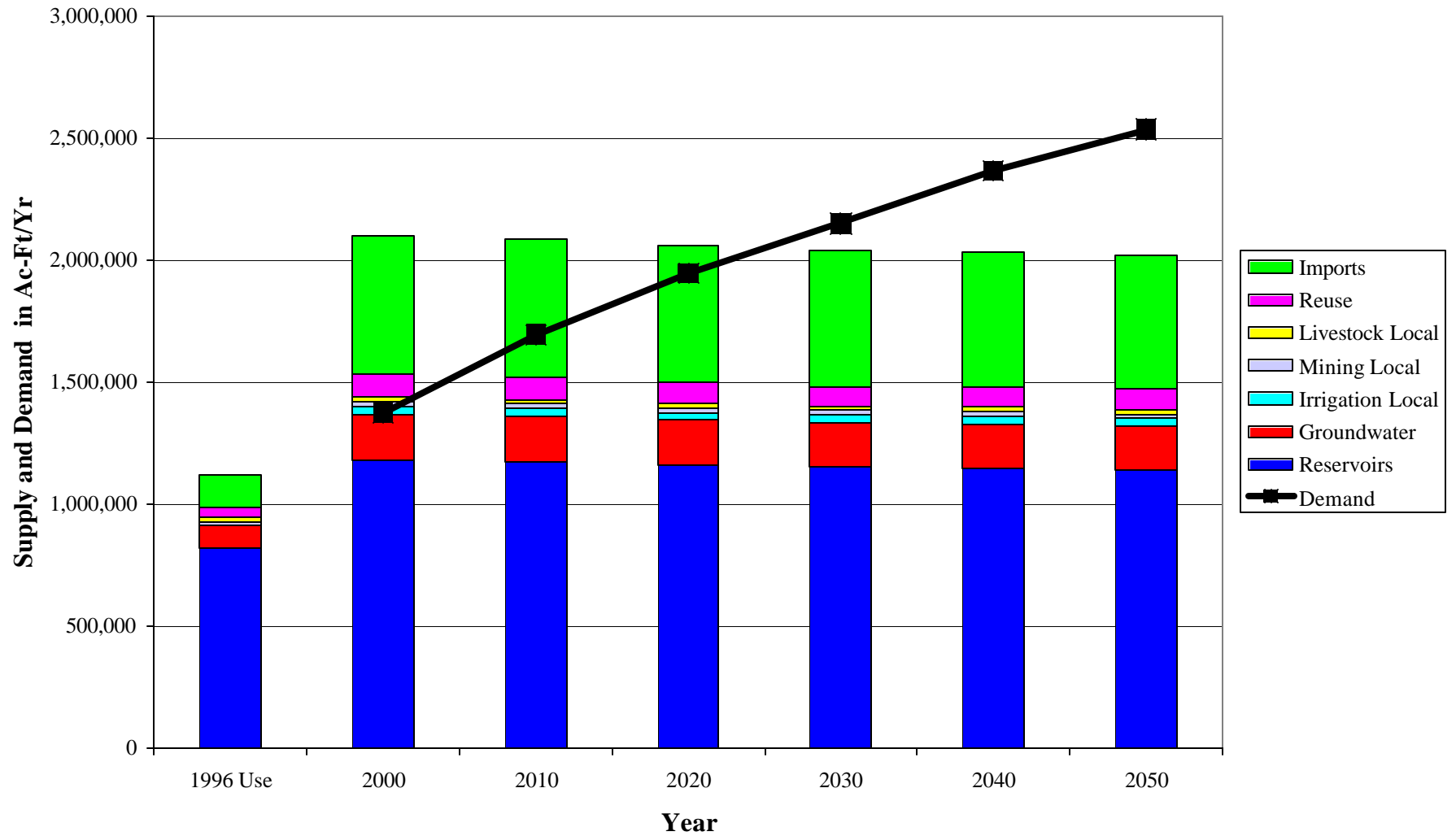
**Table 4.3**  
**Comparison of Total Connected and Unconnected Supply**  
**with Demand by Decade for Region C**  
- Values in Acre-Feet per Year -

	<b>2000</b>	<b>2010</b>	<b>2020</b>	<b>2030</b>	<b>2040</b>	<b>2050</b>
Total Connected and Unconnected Supply	2,098,855	2,085,537	2,063,360	2,044,611	2,036,896	2,022,638
Demand	1,376,373	1,695,661	1,944,893	2,149,826	2,368,188	2,536,902
Surplus (Need)	722,482	389,876	118,467	(105,215)	(331,292)	(514,264)

**Table 4.4**  
**Surplus or (Need) by County Using Only Connected Supplies**

<b>Category</b>	<b>Basin Name</b>	<b>Surplus or (Need) in Acre-Feet per Year</b>					
		<b>2000</b>	<b>2010</b>	<b>2020</b>	<b>2030</b>	<b>2040</b>	<b>2050</b>
Collin	Trinity/Sabine	23,020	(29,794)	(80,743)	(124,769)	(174,124)	(210,431)
Cooke	Trinity/Red	(3,008)	(3,087)	(3,192)	(4,034)	(4,311)	(4,609)
Dallas	Trinity	(34,250)	(168,112)	(241,696)	(267,472)	(350,525)	(415,879)
Denton	Trinity	3,108	(20,744)	(92,987)	(184,125)	(210,954)	(234,983)
Ellis	Trinity	6,935	(10,542)	(13,252)	(17,304)	(21,678)	(23,346)
Fannin	Trinity/Red/Sulphur	25,663	24,433	23,263	22,166	20,701	19,159
Freestone	Trinity/Brazos	4,057	(6,927)	(8,868)	(8,903)	(13,126)	(13,155)
Grayson	Trinity/Red	23,778	23,078	22,596	21,142	19,981	18,797
Henderson	Trinity	18,290	17,884	17,848	17,598	17,449	17,114
Jack	Trinity/Brazos	2,102	2,357	2,372	2,355	2,331	2,238
Kaufman	Trinity/Sabine	2,620	(1,024)	(3,566)	(7,921)	(10,145)	(17,119)
Navarro	Trinity	13,881	13,283	12,929	12,300	11,858	11,438
Parker	Trinity/Brazos	(1,613)	(11,469)	(15,008)	(24,715)	(30,336)	(33,874)
Rockwall	Trinity/Sabine	2,941	(6,362)	(10,849)	(15,603)	(21,694)	(28,106)
Tarrant	Trinity	30,270	(25,625)	(79,466)	(109,210)	(147,498)	(174,233)
Wise	Trinity	11,531	(1,722)	(3,429)	(6,126)	(7,981)	(9,418)
Region C Total		129,325	(204,373)	(474,048)	(694,621)	(920,052)	(1,096,407)

**Figure 4.2**  
**Comparison of Total Connected and Unconnected Supply with Demand for Region C**



management strategies to address the requirements for additional supply shown in TWDB Table 7. Many water user groups in Region C are served by major water providers, and the needs of these water user groups will be addressed by obtaining additional supplies for the major providers. Other water user groups will require the development of individual water management strategies to address their needs.

### **4.3 Comparison of Supply and Demand by Major Water Provider**

The Region C Water Planning Group has designated five major water providers for Region C:

- Dallas Water Utilities (DWU)
- Tarrant Regional Water District (TRWD)
- North Texas Municipal Water District (NTMWD)
- City of Fort Worth
- Trinity River Authority (TRA).

TWDB Table 8, which shows the comparison of currently connected supply with projected demand for each major water provider by basin and county, is presented in Appendix M. Table 4.5 summarizes the comparison of supply and demand and shows the surpluses or needs for additional supply for each major water provider. As a group, the major water providers are projected to have a need for additional supply in each decade of the planning period. Steps to meet these needs will be discussed in Section 5.

The numbers in Table 4.5 reflect two assumptions required by TWDB guidelines<sup>(1)</sup>. The TWDB requires that all contracts for water supply from major water providers be treated as demands, even if actual use of the water is not expected to occur until later. TWDB requirements on contract expiration also have an effect on the surpluses and needs shown in Table 4.5. Some contracts for water from a major water provider will expire during the planning period. As required by TWDB rules, the demands for these entities are no longer considered to be a demand for the major water provider after the contract expiration date. If Table 4.5 (and TWDB Table 8) were developed without consideration of contract expiration, the major providers would have larger needs for additional supplies, and they would make up

a larger percentage of the regional needs. The comparison of supply and demand for each major water provider is discussed below.

**Table 4.5**  
**Surplus or (Need) for Each Major Water Provider in Region C**

Major Water Provider	Surplus or (Needs) in Acre-Feet per Year					
	2000	2010	2020	2030	2040	2050
Dallas Water Utilities	(72,986)	(126,101)	(37,314)	21,833	2,866	(7,113)
Tarrant Regional Water District	12,797	(55,335)	(51,528)	(77,643)	(95,108)	(120,856)
North Texas Municipal Water District	34,253	(46,236)	(120,083)	(182,555)	(245,377)	(294,686)
Fort Worth	10,665	(9,025)	(6,288)	(15,075)	(25,665)	(35,373)
Trinity River Authority	(5,652)	(43,403)	(43,454)	(47,901)	(51,682)	(54,674)

Notes: a. As required by TWDB guidelines<sup>(1)</sup>, all contracts with major water providers are treated as demands even if actual use is not expected to occur until later decades. This results in exaggerated demands (and needs for water) in early decades.  
 b. As required by TWDB guidelines<sup>(1)</sup>, demands are assumed to disappear as current contracts expire. This results in understated demands (and needs for water) in later decades.

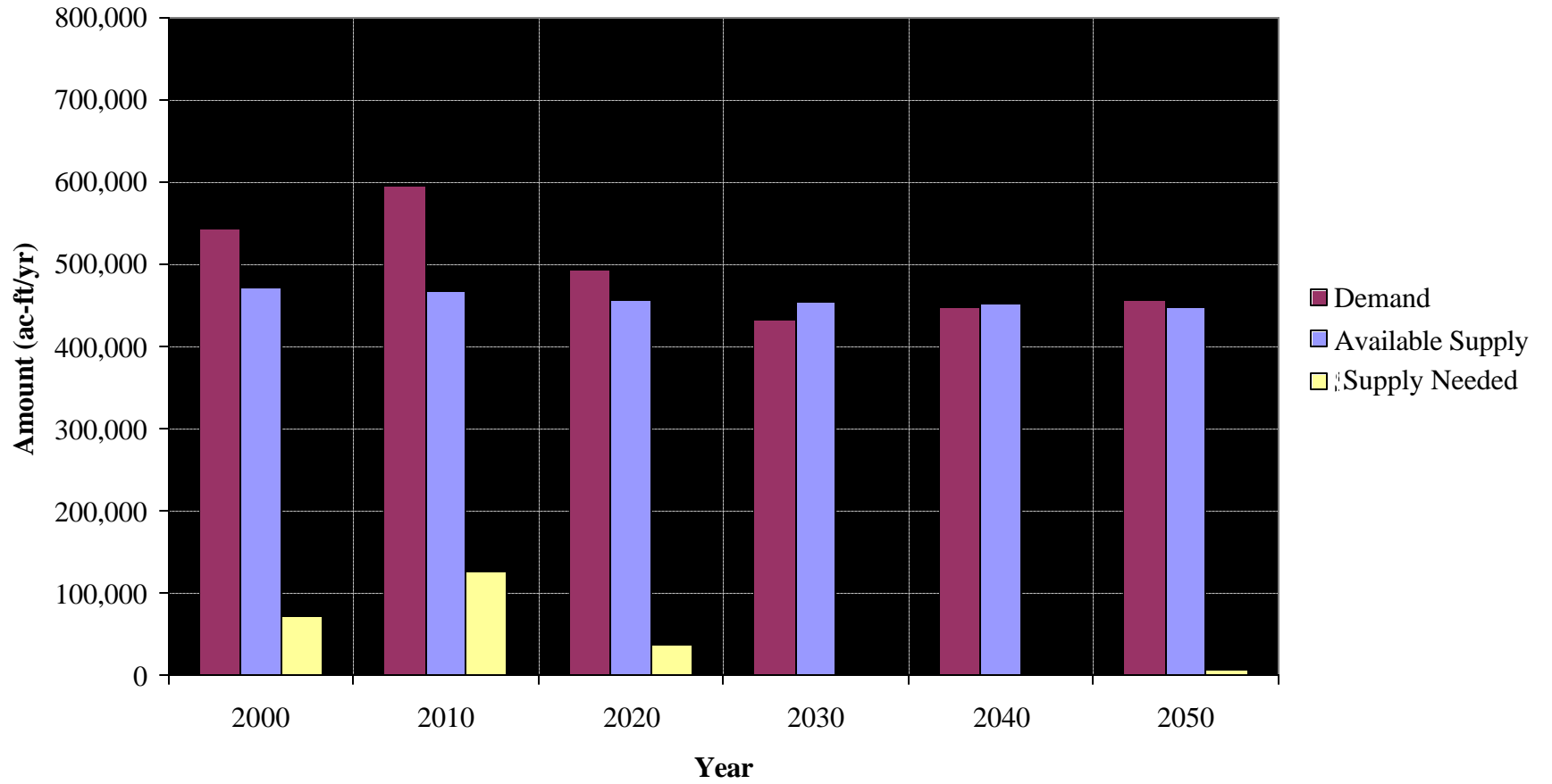
### Dallas Water Utilities

DWU has a projected requirement for more water (for drought of record conditions) of 72,986 acre-feet per year in 2000, growing to 126,101 acre-feet per year in 2010. (See Table 4.5.) DWU shows a surplus for 2030 and 2040 and needs more supply in 2050. The change from a need for water to a surplus between 2020 and 2030 is due to expiration of contracts with wholesale customers. Renewal of these contracts is a water management strategy to be considered in Task 5. Figure 4.3 shows the comparison of supply and demand for DWU, while Figure 4.4 shows the same comparison with the assumption that all contracts are renewed indefinitely.

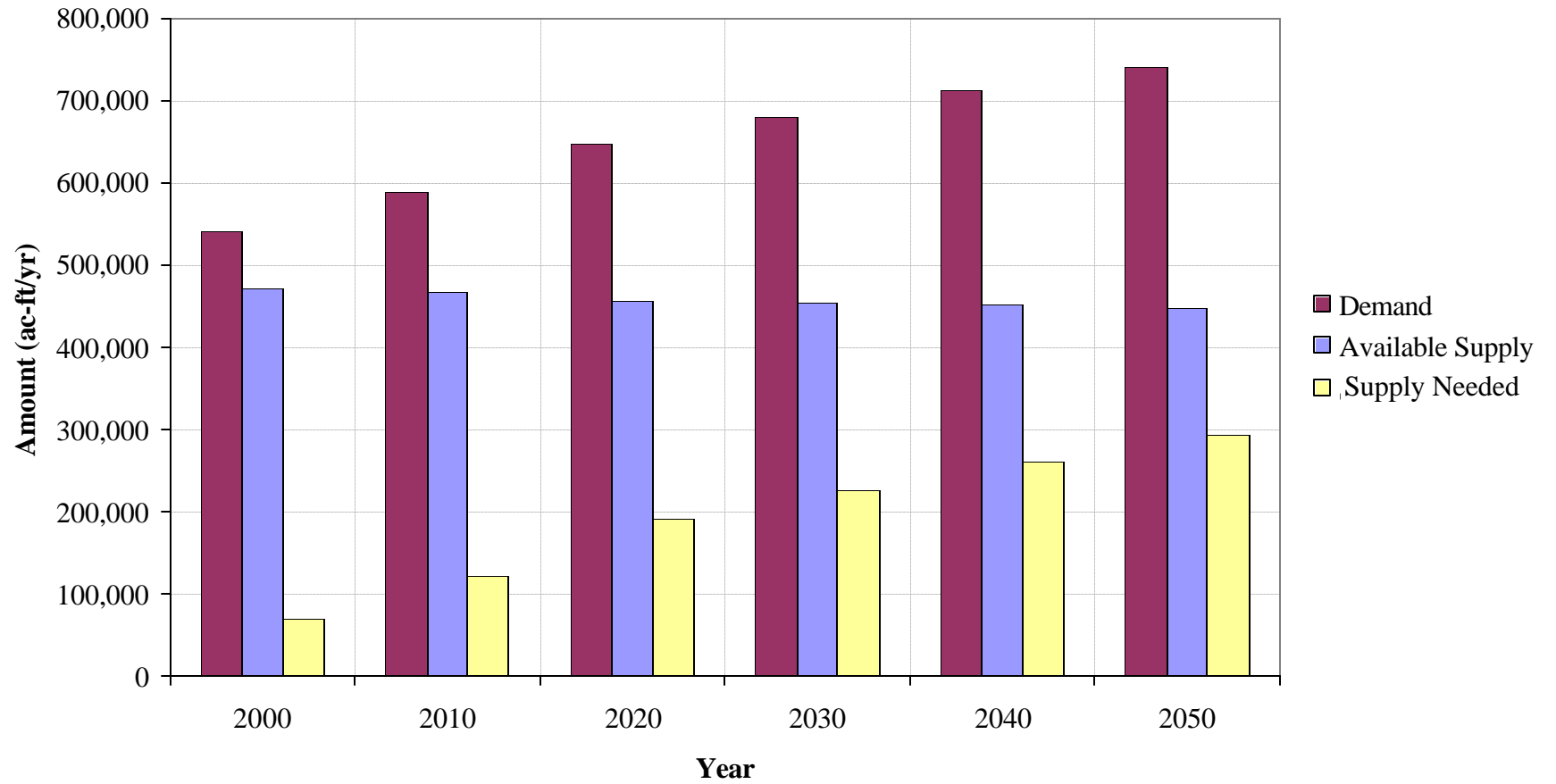
DWU has significant firm yield supplies in Lake Fork Reservoir and Lake Palestine that are not yet connected to the DWU system. Construction of the Lake Fork Reservoir transmission facilities will begin in September of 2000 and be completed by 2004. The potential supply from these reservoirs is more than 229,000 acre-feet per year in each decade of the planning period. Irving and Upper Trinity Regional Water District, both customers of Dallas, are currently constructing facilities to connect their water supplies in Lake Chapman. When these facilities are completed, the demand on DWU from these customers will be substantially reduced. To meet demands in 2000, DWU will make use of the yield available



**Figure 4.3**  
**Comparison of Connected Supply and Projected Demand**  
**for Dallas Water Utilities**



**Figure 4.4**  
**Comparison of Connected Supply and Projected Demand**  
**for Dallas Water Utilities without Contract Expiration**



from current return flows of treated wastewater around its lakes and use system operation of its lakes. In 2000, the return flows amount to 49,300 acre-feet per year, and they are not included in the comparison of supply and demand in this section. System operation and temporary overdrafting will supply the additional water needed in 2000. As discussed in Section 5, DWU is also taking other steps to develop additional supplies.

### Tarrant Regional Water District

TRWD shows a surplus of 12,797 acre-feet per year in 2000, changing to a need for an additional 55,335 acre-feet per year in 2010. By 2050, the TRWD need is 120,856 acre-feet per year. Figure 4.5 shows the comparison of supply and demand for TRWD, while Figure 4.6 shows the same comparison with the assumption that all contracts are renewed indefinitely. TRWD will obtain significant additional supplies from the Cedar Creek/Richland-Chambers system by increasing the capacity of its transmission system to Tarrant County. Section 5 describes other sources of additional supply TRWD will develop.

### North Texas Municipal Water District

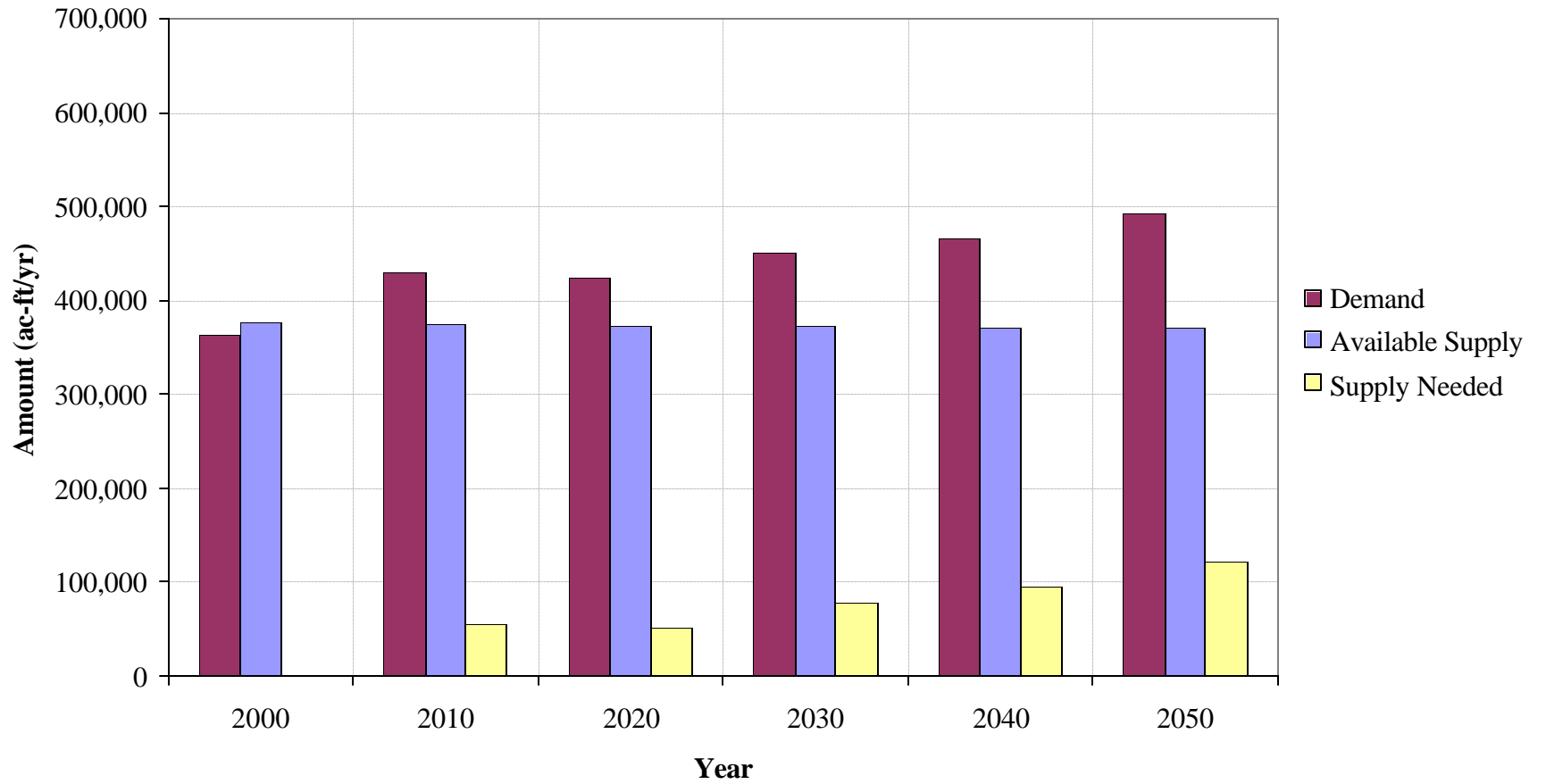
NTMWD shows a surplus of 34,253 acre-feet per year in 2000, changing to a need for 46,236 acre-feet per year in 2010. By 2050, NTMWD has a need for additional supplies of 294,686 acre-feet per year. Figure 4.7 shows the comparison of supply and demand for NTMWD. NTMWD does not have expiration dates in its contracts with customers. Section 5 describes the steps NTMWD is taking to increase its supply.

### City of Fort Worth

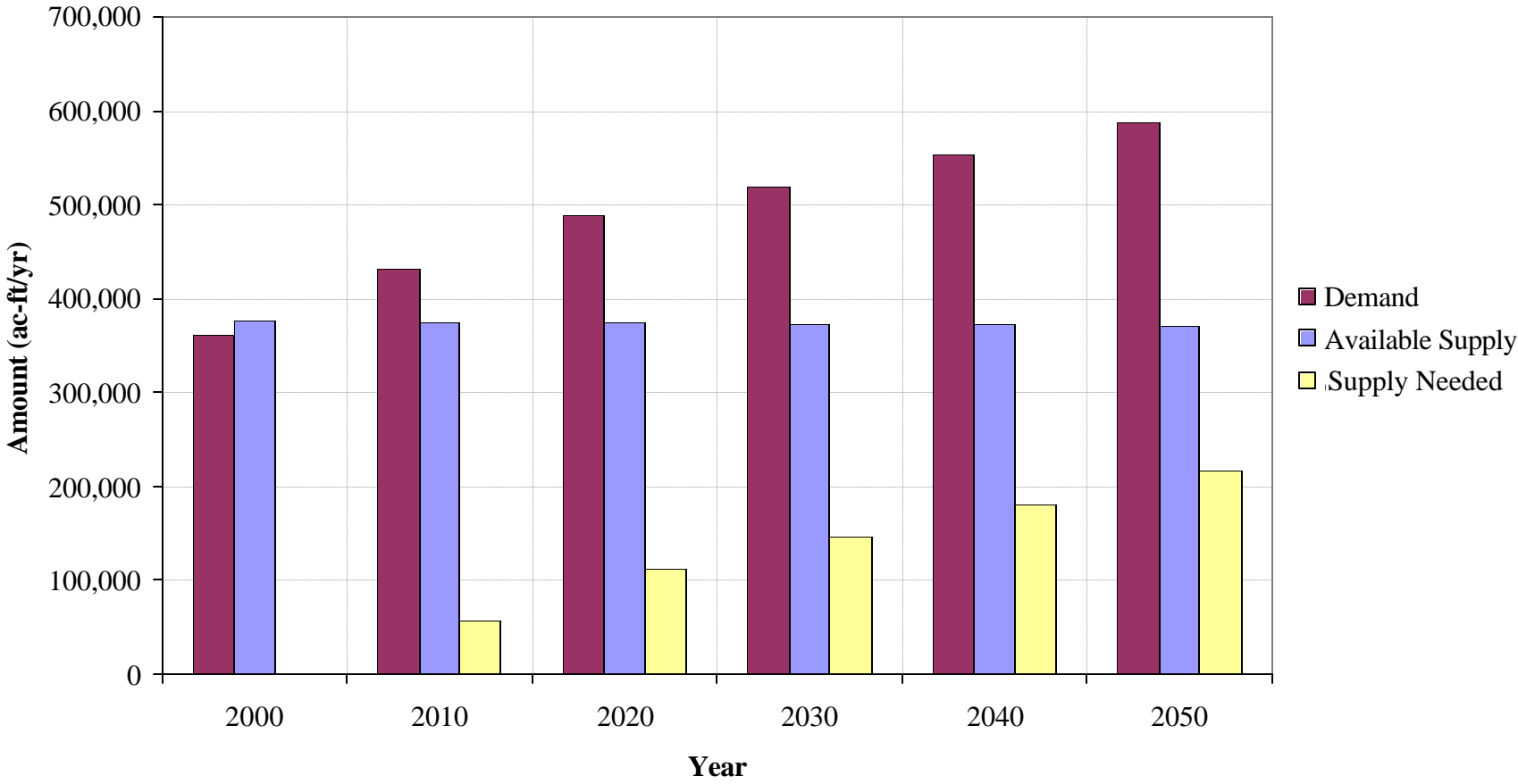
The City of Fort Worth is projected to have a surplus of 10,665 acre-feet per year in 2000, changing to a need for 9,025 acre-feet per year in 2010. By 2050, Fort Worth will need an additional 35,373 acre-feet per year. The comparison of supply and demand for Fort Worth is significantly affected by expiration of contracts, particularly after 2010. If contracts with customer cities are renewed (as they probably will be), Fort Worth will need considerably more additional supplies than shown in Table 4.5.

Fort Worth obtains all of its water from TRWD. Surpluses and needs for Fort Worth are built into TRWD surpluses and needs shown in TWDB Table 8 (Appendix M). Water management strategies that meet the needs of TRWD will also meet the needs of Fort Worth.

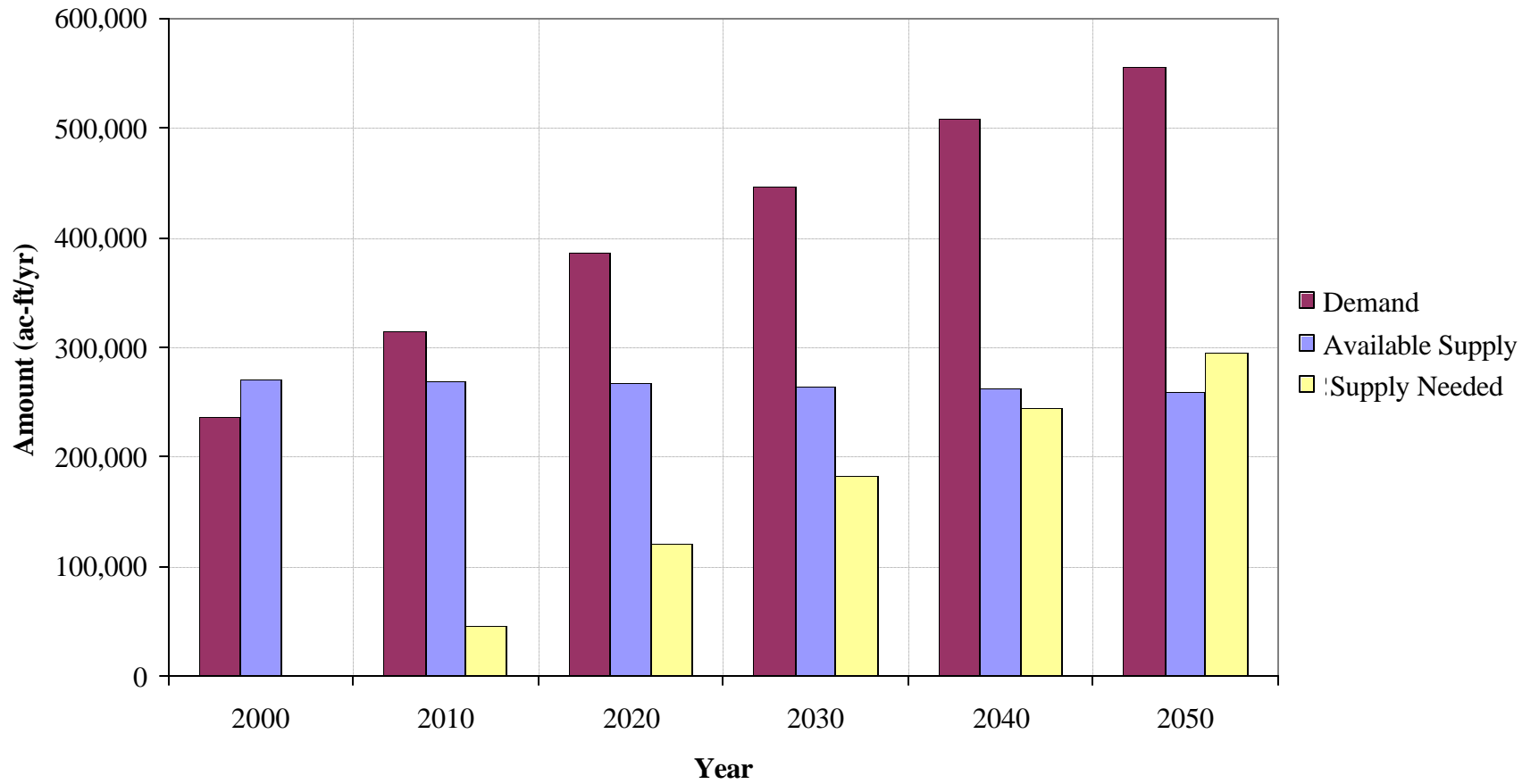
**Figure 4.5**  
**Comparison of Connected Supply and Projected Demand**  
**for Tarrant Regional Water District**



**Figure 4.6**  
**Comparison of Connected Supply and Projected Demand**  
**for Tarrant Regional Water District without Contract Expiration**



**Figure 4.7**  
**Comparison of Connected Supply and Projected Demand**  
**for North Texas Municipal Water District**



## Trinity River Authority

TRA shows a need for 5,652 acre-feet per year in 2000, changing to a need for 43,403 acre-feet per year in 2010. By 2050, the TRA need is 54,674 acre-feet per year. The need for additional water for TRA in 2000 is an artificial number created by TWDB requirements for TWDB Tables 3, 6, and 8. TWDB Table 3 is required to include all major water provider contracts, whether they are currently being used or not. TRA has contracts for long-term water supply with several entities in Ellis County, but the water is not yet needed, and the infrastructure to supply it is not in place. Thus, the need for water shown for the year 2000 is not an actual supply shortage, but merely a need that results from the TWDB guidelines for TWDB Table 3. When entities in Ellis County activate their contracts with TRA, the facilities needed to make the water available will be built. TRA receives a portion of its current supply from TRWD. Specifically, the water that TRA provides to Bedford, Colleyville, Euless, Grapevine, and North Richland Hills originates from TRWD. Therefore, planning for the needs of TRWD will meet the needs of these cities.

### **4.4 Socio-Economic Impacts of Not Meeting Projected Water Needs**

If no additional water supplies are developed, Region C will face substantial shortages in water supply over the next 50 years. The Texas Water Development Board provided technical assistance to regional water planning groups in the development of specific information on the socio-economic impacts of failing to meet projected water needs. This information is presented in TWDB Tables 9 and 10, which are included in Appendix N. Appendix N also includes TWDB's discussion of the socio-economic impacts of failing to meet water supply needs in Region C and how those impacts were determined.

The TWDB analysis of socio-economic impacts is based on information provided to TWDB in December of 2000. Table 4.6 and Figure 4.8 summarize the TWDB's analysis of the impacts of failing to take steps to supply additional water and meet the projected water needs in Region C. TWDB's findings can be summarized as follows:

- The currently connected supplies in Region C meet only 52.5 percent of the projected 2050 demand.
- Without any additional supplies, the projected water needs would reduce the region's projected 2050 population from 9,481,157 to 6,078,289, a reduction of 35.9 percent.

**Table 4.6**  
**Impacts of Water Needs in Region C If No Additional Supplies Are Developed**

**Water**

Decade	Projected Demand	Projected Water Need	Percent Shortage
	(acre-feet)		
2000	1,376,373	91,046	6.6%
2010	1,695,661	339,957	20.0%
2020	1,944,893	600,677	30.9%
2030	2,149,826	836,375	38.9%
2040	2,368,188	1,038,801	43.9%
2050	2,536,902	1,203,947	47.5%

**Employment**

Decade	Baseline Employment	Employment With No New Supplies	Percent Loss
	(FTE jobs)		
2000	2,500,725	2,340,800	6.4%
2010	2,955,702	2,438,551	17.5%
2020	3,316,463	2,481,154	25.2%
2030	3,646,334	2,488,083	31.8%
2040	4,049,283	2,557,832	36.8%
2050	4,425,184	2,605,111	41.1%

**Population**

Decade	Baseline Population	Population With No New Supplies	Percent Loss
2000	5,012,860	4,723,816	5.8%
2010	5,882,173	4,938,757	16.0%
2020	6,931,543	5,389,966	22.2%
2030	7,850,797	5,693,234	27.5%
2040	8,778,041	5,988,297	31.8%
2050	9,481,157	6,078,289	35.9%

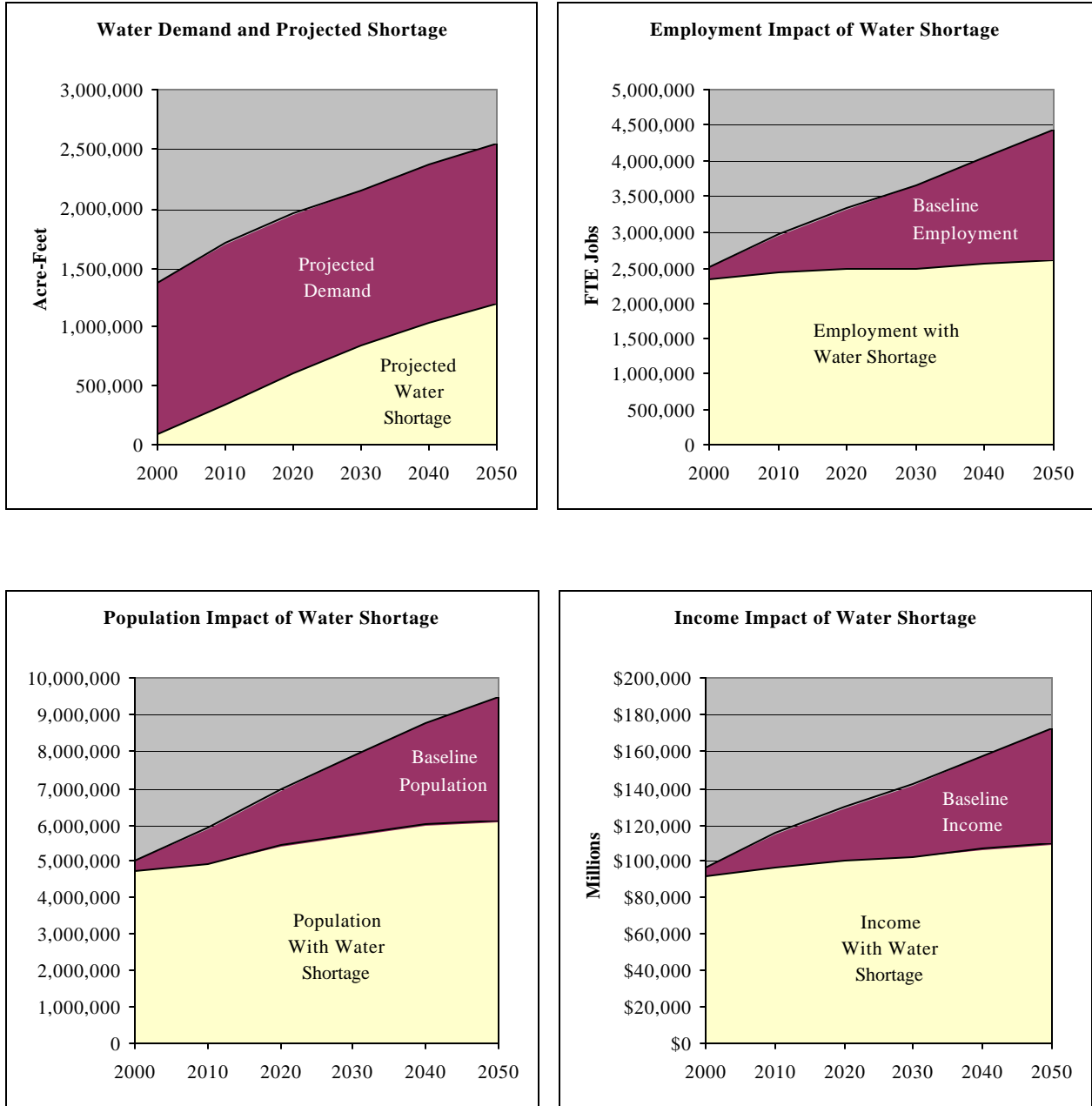
**Income**

Decade	Baseline Income	Income With No New Supplies	Percent Loss
	(millions, 1999 \$)		
2000	97,086	91,490	5.8%
2010	114,749	96,627	15.8%
2020	128,755	100,199	22.2%
2030	141,562	102,261	27.8%
2040	157,205	106,390	32.3%
2050	171,799	109,505	36.3%

Note: These impacts are based on data provided to the TWDB by Region C in December 2000.



**Figure 4.8**  
**Summary of Socio-Economic Impacts of**  
**Not Meeting Water Needs for Region C, 2000-2050**



Note: These impacts are based on shortage data provided to the TWDB by Region C in December 2000.

- Without any additional supplies, the projected water needs would reduce the region's projected 2050 employment from 4,425,184 to 2,605,111, a reduction of 41.1 percent.
- Without any additional supplies, the projected water needs would reduce the region's projected 2050 income from \$171,199,000,000 to \$109,505,000,000, a reduction of 36.3 percent.

#### **4.5 Summary of Comparison of Supply and Demand for Region C**

1. If no new supplies are developed, Region C has a net surplus of connected supply of 129,325 acre-feet per year in 2000, changing to a need for an additional 204,373 acre-feet per year by 2010. The projected need continues to grow through the rest of the planning period, reaching 1,096,407 acre-feet per year by 2050.
2. There are substantial unconnected supplies in Region C that could be made available by completing water transmission facilities.
3. The number of Region C counties with net needs for more water changes from 3 out of 16 counties in 2000 to 11 out of 16 counties in 2050.
4. There are 281 individual water user groups in Region C. Of these, 82 water user groups are projected to need more supply in 2000. The number grows to 193 by 2050.
5. Many Region C water suppliers depend on the region's major water providers (Dallas Water Utilities, Tarrant Regional Water District, North Texas Municipal Water District, Fort Worth, and Trinity River Authority) for all or part of their supplies. Each of those major water providers will need to develop additional supplies by 2050.
6. If additional supplies are not developed, the projected needs for water will have major socio-economic impacts in Region C.